LOS ANGELES CANCER SURVEILLANCE PROGRAM AND AYA@USC

Cancer in Los Angeles County:

Trends among Adolescents and Young Adults 1988-2011

USC/Norris Comprehensive Cancer Center

Keck School of Medicine of the University of Southern California

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Dennis Deapen, DrPH

Yaping Wang, MS

Kathleen Meeske, PhD

Loraine Escobedo, PhD

Lihua Liu, PhD

Myles Cockburn, PhD

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CONTRIBUTING EDITORS

Myles Cockburn, PhD
Associate Professor, Preventive Medicine

Chelsea L Collins, MD, MS
Fellow, Adolescent and Young Adult Oncology
Children's Hospital Los Angeles

Victoria Cortessis, PhD
Assistant Professor, Preventive Medicine

Wendy Cozen, DO, MPH
Professor, Preventive Medicine

Dennis Deapen, DrPH
Professor, Preventive Medicine

David Freyer, DO, MS
Professor, Pediatrics
Children's Hospital Los Angeles

Melanie Goldfarb, MD
Assistant Professor, Surgery

Ann Hamilton, PhD
Professor, Preventive Medicine

Joseph Li
Oncology Fellow, AYA Program at
University of Southern California

Lihua Liu, PhD
Assistant Professor, Preventive Medicine

Leo Mascarenhas, MD, MS
Associate Professor, Pediatrics
Children's Hospital Los Angeles

Kathleen Meeske, RN, PhD
Assistant Professor, Pediatrics
Children's Hospital Los Angeles

Roberta McKean-Cowdin, PhD, MPH
Assistant Professor, Preventive Medicine

Anna Wu, PhD
Professor, Preventive Medicine

The Keck School of Medicine of the University of Southern California

FOREWORD

Never has the power of epidemiologic data to stimulate the intensive focus of healthcare professionals, medical institutions, and patient advocates been more evident than with the rapid development of a national agenda to address the gap in improvement and survival in adolescent young adult (AYA) cancer triggered by a landmark report in 2000. This report, co-sponsored by the National Cancer Institute and the Lance Armstrong Foundation in 2005, and the report of the Young Adult Cancer Alliance in 2006, spurred a dramatic increase in the development and publication of studies focused on the AYA cancer population when only a trickle of such investigations had been published previously. Clinicians and researchers teamed up to try to identify the reasons for this "AYA Gap" including the unique psychosocial issues, the biology of their cancers, lack of health insurance and limited services for this population. In reality, a new discipline in oncology developed, much like the birth of geriatric oncology in the past two decades.

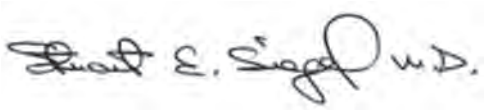
Where are we now? In 1990 only 129 peer-reviewed publications on AYA oncology appeared, compared to 4045 in the year 2000. Many major cancer centers have or are developing clinical programs and research initiatives specifically targeting the AYA cancer population. Specialized facilities geared to provide the environment and supportive care older adolescents and young adults with cancer need are being created.

But what about the impact on the individual adolescent and young adult with cancer? Establishing their identity, their independence, and their life's path is the work of this time in their lives. It is a vulnerable point in human development characterized by uncertainty and change, probably the worst possible time for a disease like cancer to enter their world as a very "uninvited guest". They need evidence-based care that is developed from data specific to their cancers and to the psychological and economic environment in which they exist. That data is still relatively sparse when compared to the voluminous information available for pediatric and older adult cancer populations.

Finally, one of the five recommended areas of focus to improve the outcome of AYA cancer patients is to enhance the knowledge and advocacy of adolescents and young adults with cancer. They, too, need reliable data to do so, and that data must be relevant to the diversity of this patient population in addition to their shared challenges.

This report adds important new data that will help us move the field of AYA oncology forward. It is the first large scale evaluation of the characteristics of cancer in this population since the original. By focusing on the population of AYA cancer patients in Los Angeles County with its highly diverse composition and especially large population of Hispanic patients, the authors provide new insights into the characteristics and needs of this population

of patients that make up a growing percentage of our nation's people. Hopefully, this report will result in raising more questions and stimulate more innovative studies. Equally important are the insights these data will provide to all clinicians, other healthcare providers, healthcare policy makers and patient advocates working in the field of oncology about the challenges that AYA patients face in our ethnically and culturally rich population. Combined with the previously published data, the information presented in this document will provide a broad characterization of the AYA population in the United States that will be important as a basis for developing future studies and policy.



Stuart E. Siegel, M.D
Co-Medical Director
Adolescent and Young Adult Cancer Program
Kenneth J. Norris/University of Southern California
Comprehensive Cancer Center
Professor of Pediatrics and Medicine
Keck School of Medicine
University of Southern California

EXECUTIVE SUMMARY

The Los Angeles Cancer Surveillance Program (CSP) serves as a resource to generate new hypotheses regarding cancer causes, to monitor trends and patterns of cancer incidence, and to identify population subgroups at high risk of cancer. Monitoring rates of cancer can provide a "report card" demonstrating how well cancer prevention programs are working. Government officials and policymakers use trends in cancer rates to determine funding for treatment and related social services.

Los Angeles County is the most populous and ethnically diverse county in the U.S. The substantial differences among rates of most cancers among subgroups such as men and women and various race/ethnic groups provide clues for a better understanding of cancer. Highlights of cancer incidence trends among adolescents and young adults (AYA) (ages 15-39 years) in Los Angeles County from 1988 to 2011 include:

- **Bone cancers** are relatively rare and incidence rates have changed little over this time period.
- **Brain and central nervous system cancers** include several different types of cancers that tend to increase with age over the AYA age range. Rates appear to be rising, with Vietnamese females at highest risk although the number of cases in this group is very small.
- **Breast cancer** is the most common cancer among AYA females. Breast cancer rates are highest for black, non-Latina white, Filipino and Vietnamese women. Higher socioeconomic status (SES) is associated with higher risk regardless of race/ethnicity.
- **Cervical cancer** has been decreasing and is the most common cancer among Latinas and least common among Chinese.
- **Colorectal cancer** risk is greater for males than females aged 35-39, but does not differ at younger ages.
- **Head and neck cancers** (excluding thyroid) incidence is highest for non-Latino whites and blacks.
- **Kaposi's sarcoma** rates are highest among black and non-Latino white males but have significantly declined.
- **Leukemia** varies by type. Acute lymphoblastic leukemia (ALL) among white males is approximately twice that for non-Latino white males and four times that among black males. For females, the rate among Latina whites is approximately twice that seen in both non-Latino white and black females. In contrast, there was no difference in incidence of acute myeloid leukemia (AML) by race/ethnicity or SES.
- **Hodgkin lymphoma** rates are highest among female non-Latinas followed by blacks and Latinas. Incidence increases with increasing SES.
- **Non-Hodgkin lymphoma** rates among Latino males, and to some extent, Asian males, increase with increasing SES. Among non-Latino white males, the SES trend is reversed, with highest incidence among the lowest SES groups.

- **Melanoma** rates are highest among non-Latino white females and males. There are strong SES patterns with more affluent AYAs having higher rates of melanoma.

- **Ovarian cancer** rates are highest among Filipinas and lowest in blacks.

- **Testis cancer** has increased steadily from 1988-1991 to 2007-2011. Rates are more than 5 times higher among non-Latino whites than among blacks. Testicular cancer begins to rise in adolescence, peaks in the 20's and declines thereafter.

- **Thyroid cancer** rates increased for males and females over the past decade, but at a greater rate in females compared to males. Rates are highest in Filipinos, Vietnamese, non-Latino whites and Latinos. For Latino and non-Latino whites there are moderate SES increases with higher rates of thyroid cancer in more affluent AYAs.

- **Uterine cancer** has become more frequent with the highest rate found in Filipinas and the lowest in blacks.

PREFACE

Cancer is the leading cause of non-accidental death among adolescents and young adults (AYA) (ages 15-39 years) in the U.S. Despite major improvement in outcomes for children and older adults with cancer over the past three decades, there has been little or no improvement in survival among AYA cancer patients. The reasons for this are not completely understood and are likely multi-factorial, including differences in tumor biology, insurance coverage, clinical trial participation and adherence to treatment.

In Los Angeles County, some cancer centers are developing AYA programs to facilitate scientific research, improve outcomes and address the psychosocial needs of this population. Understanding this unique population is a critical first step in developing effective clinical and research programs for AYA cancer patients and in targeting effective cancer control. High-quality cancer registries are central to those efforts. In each U.S. state, cancer registries identify newly diagnosed cancer patients to track trends and create opportunities for research.

The Los Angeles Cancer Surveillance Program (CSP) is the population-based cancer registry for Los Angeles County, California. Since 1972, the CSP has collected and analyzed information on all new cancers diagnosed among residents of the County. Over the past 42 years, with the participation of physicians, hospitals and cancer patients, this information has produced major contributions to the knowledge and understanding of cancer: its causes, treatment, and effects on the lives of cancer patients and their families. Healthcare providers and researchers frequently use the information to help control cancer.

The CSP is a member of the statewide population-based cancer surveillance system, the California Cancer Registry. It is also part of the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) program and is supported by the Centers for Disease Control and Prevention's National Program of Cancer Registries. The CSP is administered by the Keck School of Medicine of the University of Southern California and the USC/Norris Comprehensive Cancer Center. Leveraging the large and diverse population of Los Angeles County, the CSP has served as a resource for many epidemiological studies of cancer. This volume on AYA cancers provides physicians, researchers, public health officials and the public with high-quality data documenting the trends of many different types of cancer among individuals 15 to 39 years of age in Los Angeles County over the past 24 years. These data illustrate considerable differences in cancer incidence between men and women and among various racial/ethnic groups in ways not previously available to our community. These differences not only identify the types of persons at greater and lesser risk of each cancer, but also offer intriguing clues that may lead to better understanding and prevention of cancer.

This report was prepared by the following CSP researchers: Dennis Deapen, DrPH, director and Professor; Yaping Wang, MS, statistician, Kathleen Meeske, PhD, pediatric cancer epidemiologist and Assistant Professor; Loraine Escobedo, PhD, research assistant, Lihua Liu, PhD, demographer and Assistant Professor; and Myles Cockburn, PhD, epidemiologist and Associate Professor. As with all reports produced by the CSP, great appreciation goes to the hospital cancer registrars, the CSP field technicians, and other CSP staff whose dedication and hard work provide the foundation for this report.

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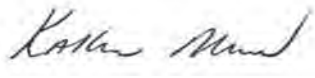
Myles Cockburn

Lihua Liu

Dennis Deapen



Kathleen Meeske

Yaping Wang

Loraine Escobedo

INTRODUCTION

ADOLESCENT AND YOUNG ADULT (AYA) CANCERS

Cancer is the leading cause of non-accidental death among adolescents and young adults (AYA) (ages 15-39 years) in the U.S. An estimated 71,180 AYAs were diagnosed with cancer in 2011, seven times more than the number diagnosed under the age of 15. In Los Angeles County, approximately 2,600 AYAs are diagnosed with cancer each year.

Incidence rates of AYA cancers vary by race and ethnicity. Cancer incidence rates are highest among whites while blacks and Latino whites have intermediate rates. Rates in the Asian populations (Chinese, Filipino, Korean, Japanese, Vietnamese) vary widely.

The distribution of AYA cancer types differs from older and younger people and changes dramatically over the span of ages 15 to 39 years. For example, leukemia, lymphoma, and testicular cancer are the most common cancer types in younger patients 15 to 24 years. Among older AYA patients 25 to 39 years, breast, cervical and uterine, and colorectal cancers are the more common cancer types.

Despite major improvement in outcomes for children and older adults with cancer over the past three decades, there has been little or no improvement in survival among AYA cancer patients. While the reasons for this disparity are not completely understood, factors that may contribute to the lack of improved outcomes for AYA patients include: differences in tumor biology, insurance coverage, adherence to treatment and clinical trial participation. AYA patients are more likely to experience a delay in diagnosis and less likely to be referred to comprehensive cancer centers than other age groups. Furthermore, this age group has the lowest rate of cancer clinical trial participation, other than the very elderly.

Our understanding of the biology and etiology of AYA cancers is limited. For example, it is unknown why among AYA women incidence rates for breast cancer are higher for black women than white women when the reverse is true for women 40 years and older. Furthermore, it is unclear why AYA women with breast cancer are diagnosed with more aggressive disease than older women.

The AYA population also has unique challenges and psychosocial needs due to their age-related development tasks that include establishing/maintaining independence, identity formation and education/employment and family planning.

Due to the unique needs of the AYA population, cancer centers are beginning to develop special AYA units and programs, designed to facilitate and support AYA research, improve clinical trial enrollment, train medical professionals in the management of AYA patients and to provide age-appropriate supportive services for AYA patients.

HISTORICAL BACKGROUND OF THE CSP

The CSP is the population-based cancer registry for Los Angeles County. It identifies and obtains information on all new cancer diagnoses made in the County. The CSP was organized in 1970 and operates within the administrative structure of the Keck School of Medicine and the Norris Comprehensive Cancer Center of the University of Southern California. In 1987, it became the regional registry for Los Angeles County for the then new California Cancer Registry. The CSP is one of 10 such regional registries collectively providing statewide coverage. In September of 1992, the CSP joined the National Cancer Institute's Surveillance, Epidemiology and End Results (SEER) program. This consortium of 18 population-based SEER registries provides the federal government with ongoing surveillance of cancer incidence and survival in the U.S. To date, the CSP database contains more than 1.7 million records and about 41,000 incident cancers are added annually. The CSP is one of the most productive cancer registries in the world, in terms of scientific contributions toward understanding the demographic patterns and the etiology of specific cancers. The CSP has a bibliography of more than 4,000 publications in scientific journals. The registry supports a large ongoing body of research funded mainly by the U.S. National Cancer Institute, other cancer research organizations and the State of California.

THE DIVERSE POPULATION OF LOS ANGELES COUNTY

Los Angeles County is the most racially/ethnically diverse county in the United States (US). The number of residents living in Los Angeles County exceeds 10 million, according to the 2013 population estimates.[1] Hispanic or Latino individuals account for 48.2% of the County's total population, in contrast to 38.2% in California and 16.9% in the US.[1] The proportion of non-Latino white in Los Angeles County is 27.3%, as compared to 39.4% in California and 63.0% in the US.[1] About 9.3% of the country's Latinos, 9.2% of total Asian Americans, and 4.8% of US Pacific Islanders live in Los Angeles County.[2] People of multi-race count for 4.5% of the County's total population, much higher than the national average of 2.9%.[2]

The 1.4 million Asian Americans in Los Angeles County include 0.4 million Chinese, 0.3 million Filipino, 0.2 million Korean, 0.1 million Japanese, over 90,000 Vietnamese, and about 80,000 Asian Indian.[3] Los Angeles County is also home to nearly 26,000 Native Hawaiians and Other Pacific Islanders.[3] Among the 4.7 million self-reported Hispanics or Latinos in the County, 74.9% identified as Mexican, 7.7% Salvadoran, 4.6% Guatemalan, 1.0% Puerto Rican, 0.9% Cuban, 0.9% Honduran, 0.8% Nicaraguan, and 2.5% South Americans.[4] A higher proportion (45.1%) of Latinos in Los Angeles County identified themselves as "Other" race than in the US as a whole (36.7%).[2]

About 3.5 million Los Angeles County residents are foreign-born; 27.3% of them entered the country since 2000.[5] More than half (57.2%) of the total population five years of age or older speak a language other than English.[1]

The 2.7 million non-Latino white population also has highly diverse origins. The population of European origin includes large numbers of persons from Britain, Germany, Ireland, Italy, Russia, France, and other parts of Europe. In the past 30 years the County has experienced a substantial influx of immigrants from Iran, Lebanon and the former Soviet Union. The Armenian community is estimated to number more than 200,000. Over 82,000 individuals of Arabic descent live in Los Angeles County.[6]

Every numerically important religious group in the United States is represented with sizeable populations. There is also a wide variation in socioeconomic as well as sociocultural characteristics of the County population. Occupation and industry data reflect the diversity one would expect of a large urban metropolis. Los Angeles County is also characterized by geographic diversity, with regions of mountains, valleys, deserts, and seashores.

With its large and diverse populations, Los Angeles County is an ideal place for monitoring disease occurrence and conduct epidemiologic investigations. The adolescent and young adult population, individuals of 15-39 years of age, is currently estimated as more than 3.7 million.

HOW CANCER IS REGISTERED

Under the California model of reporting, a passive cancer surveillance system has been implemented statewide, in which hospitals and other facilities where cancer is diagnosed or treated bear the responsibility for identifying and reporting cancer cases to the local registry within six months after the patient's diagnosis or treatment. To provide complete demographic and treatment information on each new cancer occurring among the residents of Los Angeles County, and to guarantee compliance with reporting requirements, the CSP combines elements of an active and a passive surveillance system. For active surveillance, each of the medical facilities in which microscopic verification of cancer occurs is monitored by a CSP field technician who systematically screens all hematology and pathology reports to identify all previously unreported cancer diagnoses. The State-mandated passive surveillance system requires each hospital or other reporting facility to complete a full report known as an abstract, including stage and treatment information, on every cancer case seen at the facility. All completed abstracts are linked by the CSP to the pathology reports obtained under active surveillance to assure that one abstract is completed for each histologically-verified cancer diagnosis. In addition, any previously unrecognized cancer diagnoses among Los Angeles County residents, identified as a result of searching computerized death records, are traced back to patient records in hospitals or other facilities so that data can be abstracted, when possible, in a similar way to data found using pathology reports.

USE OF CSP DATA FOR RESEARCH

The CSP data serve as a descriptive epidemiological resource to generate new hypotheses regarding specific cancer sites or histologic subtypes, monitor descriptive trends and patterns of cancer incidence, and identify demographic subgroups at high risk of cancer. A high priority is always placed on exploring demographic patterns and trends in cancer incidence among the racially and ethnically diverse population of Los Angeles County.

THE IMPORTANCE OF INVESTIGATING TIME TRENDS

To keep an eye on cancer rates

Monitoring cancer rates provides clues about what causes cancer. When we observe a change in the rate of cancer that seems to follow a change in some environmental exposure, we consider the possibility of a link between the exposure and cancer. For example, at the beginning of last century, increasing lung cancer rates followed the introduction and increasing popularity of cigarettes and smoking.

To know whether cancer control efforts are working

We also monitor cancer rates to provide a "report card" on how well cancer prevention programs work. We generally expect that a successful intervention program, such as the introduction of the HPV (human papillomavirus) vaccine should be followed by a decline in cervical and other HPV-related cancer rates.

To decide what resources are required to fight cancer

Because cancer is such an important health problem and is costly in terms of treatment and social costs such as loss of work time and quality of life, it is important to have a clear idea of the changing burden of cancer on society. Government officials and policymakers use trends in cancer rates to determine funding for screening, treatment and related social services, as well as to establish priorities for supporting effective research into the causes and prevention of cancer and the development of treatments.

To see the effect of changes in cancer screening and detection methods

Many things can cause a change in cancer rates, including changes in the distribution of the factors that cause the disease, changes in our ability to prevent or detect cancer early, changes in the population, changes in diagnostic criteria to define a type of cancer, and even simple random variation.

To make cancer a disease of the past

Keeping an eye on cancer rates provides clues about the causes of cancer, how successful we are at preventing cancer, and where we should focus our efforts in the future to make cancer a disease of the past.

PROTECTION OF CONFIDENTIALITY

Confidentiality procedures at the CSP are rigidly formulated and maintained. All employees of the CSP sign a confidentiality pledge after being advised of the necessity for maintaining strict confidentiality of patient information, and are shown methods to assure this. Any records containing identifying information are transported to the CSP in locked carrying cases and are stored in locked filing cabinets at the CSP. Confidentiality of computerized data is assured by highly restricted access. All reports and summaries produced for distribution by the CSP, such as those presented here, are in statistical form without any personal identifiers. All individual studies using confidential information obtained from the registry are individually reviewed by the USC Institutional Review (Human Subjects) Board, as is the registry itself on a regular basis. For studies from outside investigators, review and approval by a federally approved institutional review board is required.

MATERIALS AND METHODS

INCIDENCE DATA

Cancer incidence data contained in this report are based on new AYA cases of cancer who were first diagnosed among Los Angeles County residents from January 1, 1988 to December 31, 2011, and were reported to the CSP by November of 2013. A total of 62,355 AYA cancers were newly diagnosed among Los Angeles County residents between January 1, 1988 and December 31, 2011. Our AYA study population includes individuals between the ages of 15 to 39 years as designated by the National Cancer Institute.

Cancers are distinguished by whether they are invasive (those that have spread into surrounding healthy tissue) or *in situ* (early cancer that has not invaded surrounding cells or tissue). In this report we include only invasive cancers, except for brain and central nervous system that includes all tumors.

We classified cancers based on the Surveillance Epidemiology and End Results (SEER) AYA site recode (Appendix B and C). The SEER AYA site recode was developed to better define the major cancer sites that affect the AYA population and has been recently updated. This classification code is intended to facilitate the reporting of AYA cancer incidence rates and trends. 6,336 AYA cancer cases (about 10% of total) were unclassified based on this scheme and therefore were excluded in this report. They are mostly due to their non-invasive tumor behaviors. Among them, 3,853 (61%) are cases with in situ behavior and largely are breast (877), other female genital organs (919), and skin (1,420) cancers; 1,255 (20%) are a no longer reportable behavior of ovary cancer, and 969 (15%) are benign tumors, most of them pituitary gland tumors (916). Other tumor behaviors (4%) which were not recodeable include 210 which were only malignant in ICD-O3, 10 which were only malignant in 2010 and later and 39 borderline tumors.

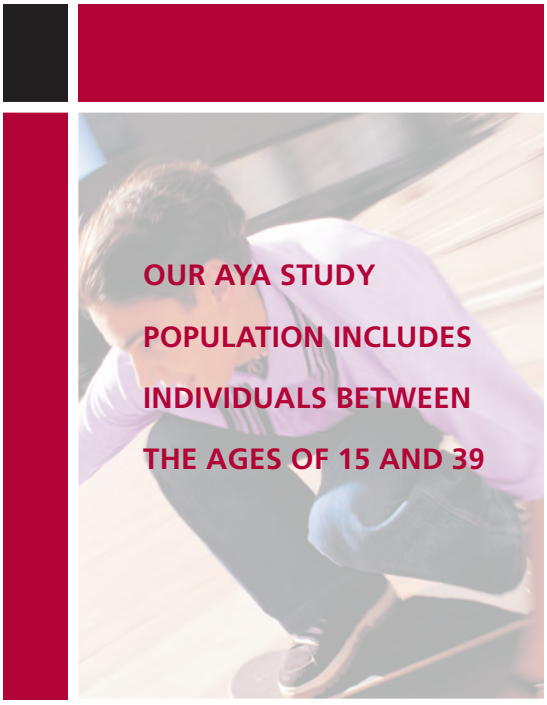
We present cancer incidence rates separately for men and women, race/ethnic groups, age groups, socioeconomic status (SES), birthplace and stage at diagnosis. The white population of Los Angeles County was split into Latino and non-Latino whites. The remaining population is separated into blacks and Asian/Other and we further defined Asian subgroups as Chinese, Japanese, Filipinos, Koreans, and after 1990, four additional groups: Vietnamese; South Asian (including Indians, Pakistani, Sri Lankan, and Bangladeshi); Thai/Hmong/Cambodian/Laotian; and Hawaiian/Samoan. We describe how race/ethnicity and SES categories are defined and obtained for cancer patients and the Los Angeles population in Appendix A. A total of 56,019 AYA cancers diagnosed in Los Angeles County between January 1, 1988 and December 31, 2011 are reported here. All cases had a site-specific recode except 194 cases (0.4%) with unspecified malignant tumors, which we included in all AYA cancer combined.

CAUTIONS IN INTERPRETATION

Cancer incidence data in this report are based on cases of primary cancer that were reported to the CSP as of November of 2013. Case reporting for 2011 was estimated to be at least 95 percent complete by that time. Going forward, a small number of additional cases will continue to be reported for 2011, and for earlier years. This may have a minor effect on the final incidence rates for this period.

The reliability of race/ethnicity-specific rates depends on the accuracy of race/ethnicity classification of the cancer patients and of the Los Angeles County population. Some small part of the variations in race/ethnicity-specific rates may reflect misclassification rather than a true difference in cancer risk. The county population estimates are based on self-identification at the time of the 2000 census. Race/ethnicity information for cancer cases is based primarily on information contained in the patient's medical record. This information may be based on self-identification by the patient, on assumptions made by an admission clerk or other medical personnel, or on an inference made using race/ethnicity of parents, birthplace, maiden name or last name. The reporting of race/ethnicity in any system may be influenced by the racial/ethnic distribution of the local population, local interpretation of data collection guidelines, as well as other factors.

Finally, special caution should be used when interpreting the meaning of the rates that are based on only a few cases. Rates based on small numbers are statistically unstable. For that reason, we have adopted the convention of only graphing points that are based on at least 20 cases. No suppression was made on graphs by SES to better visualize trends.



DISTRIBUTION OF ALL CANCERS COMBINED BY AGE, SEX AND RACE/ETHNICITY

When considering the overall rate of cancer, it is important to remember that cancers occurring at different sites are in fact very different diseases. Therefore, little practical information about the causes of cancers can be obtained from comparing the rate of all cancers combined. We provide the comparison of average annual age-adjusted rates for all cancer sites combined to demonstrate the importance of cancer as a whole, and in comparison to other groups. In this section we examine the overall rates of cancer in Los Angeles County during 1988-2011 by age, by age and sex, and by sex and race/ethnicity.

About 3.7 million people aged 15-39 live in Los Angeles County. A total of 62,355 AYA cancers were newly diagnosed among Los Angeles County residents between January 1, 1988 and December 31, 2011.

AVERAGE ANNUAL POPULATIONS OF ADOLESCENTS AND YOUNG ADULTS BY AGE, SEX, AND RACIAL/ETHNIC GROUP IN LOS ANGELES COUNTY, 1988-2011

	Males				Females			
Race/Ethnicity	Ages 15-24	Ages 25-34	Ages 35-39	All Ages 15-39	Ages 15-24	Ages 25-34	Ages 35-39	All Ages 15-39
Latino White	390,905	379,435	154,498	924,838	346,538	344,390	148,506	839,434
Black	71,017	70,219	34,236	175,472	73,931	80,717	39,934	194,582
Non-Latino White	181,492	257,974	133,260	572,726	175,783	238,825	122,613	537,221
Chinese	25,205	25,728	13,042	63,975	24,293	28,489	15,306	68,088
Japanese	6,844	9,314	4,927	21,085	6,935	10,385	5,538	22,858
Filipino	20,604	20,119	10,041	50,764	20,328	23,369	12,491	56,188
Korean	13,126	15,441	7,295	35,862	13,034	16,969	8,594	38,597
Vietnamese	7,048	7,385	3,578	18,011	6,466	7,362	3,638	17,466
Indian, Pakistani, Sri Lankan and Bangladeshi	6,010	8,668	3,820	18,498	5,311	7,701	3,144	16,156
Thai, Hmong, Cambodian and Laotian	5,199	4,263	1,999	11,461	5,181	5,231	2,520	12,932
Hawaiian and Samoan	2,081	1,840	781	4,702	2,123	1,926	827	4,876
Other	13,959	19,176	9,206	42,341	13,594	17,419	8,482	39,495
Total	743,490	819,562	376,683	1,939,735	693,517	782,783	371,593	1,847,893

BY AGE

The overall rate of cancer increases with age. Therefore, the lowest rate of cancer among AYAs is among the youngest age group, 15 to 24 year olds. The rate of cancer among 25 to 34 year olds is more than twice the rate of cancer among the youngest age group. The oldest age group of AYAs, 35 to 39 year olds, have the highest rates of cancer.

BY AGE AND SEX

In the youngest age group, 15 to 24 year olds, males have slightly higher rates of cancer than females. In the age group of 25 to 34 year olds, females have higher rates of cancer than males. In the oldest age group, 35 to 39 year olds, females have much higher rates of cancer than males. The overall rate of cancer for AYAs of all ages combined is higher for females than for males. As stated above, the overall rate of cancer increases with age. Male AYAs in the oldest age group have nearly four times the rate of cancer as those in the youngest age group. Females in the oldest age group have more than six times the rate of cancer as females in the youngest age group.

NUMBER OF CANCER CASES OCCURING AMONG ADOLESCENTS AND YOUNG ADULTS BY SEX AND RACIAL/ETHINC GROUP IN LOS ANGELES COUNTY, 1988-2011

Race/Ethnicity	Males	Females
Latino White	9,268	11,760
Black	2,026	3,030
Non-Latino White	11,325	11,881
Chinese	461	858
Japanese	158	305
Filipino	425	966
Korean	224	501
Vietnamese	221	335
Indian, Pakistani, Sri Lankan and Bangladeshi	103	175
Thai, Hmong, Cambodian and Laotian	86	152
Hawaiian and Samoan	28	68
Other	744	919

BY SEX AND RACE/ETHNICITY

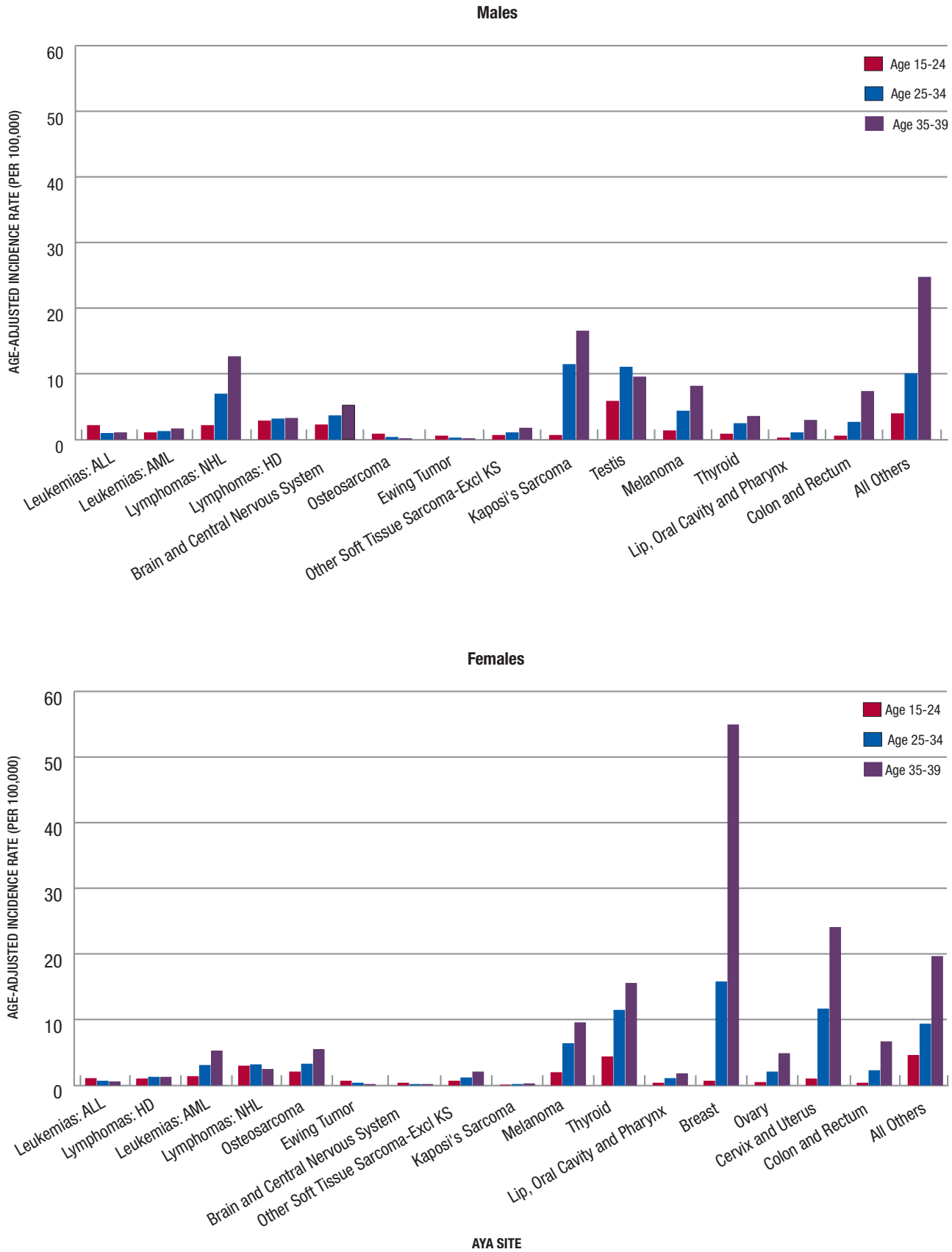
Females have higher overall rates of cancer than males for each racial/ethnic group. Non-Latina white females have the highest overall rates of cancer. Females who are Vietnamese, black, or Latina whites also have high overall rates of cancer. Non-Latino whites have the highest overall rates of cancer among males. Vietnamese, blacks, and Latino white males also have high overall rates of cancer.

BY SEX, AGE AND ANATOMIC SITE

Cancers of different anatomic sites are more common in different age groups. Thyroid cancer and lymphomas are the most common cancers among female 15 to 24 year olds. Breast and cervix/uterus are the most common cancers among female 25 to 34 year olds, 35 to 39 year olds, and all female AYA ages combined.

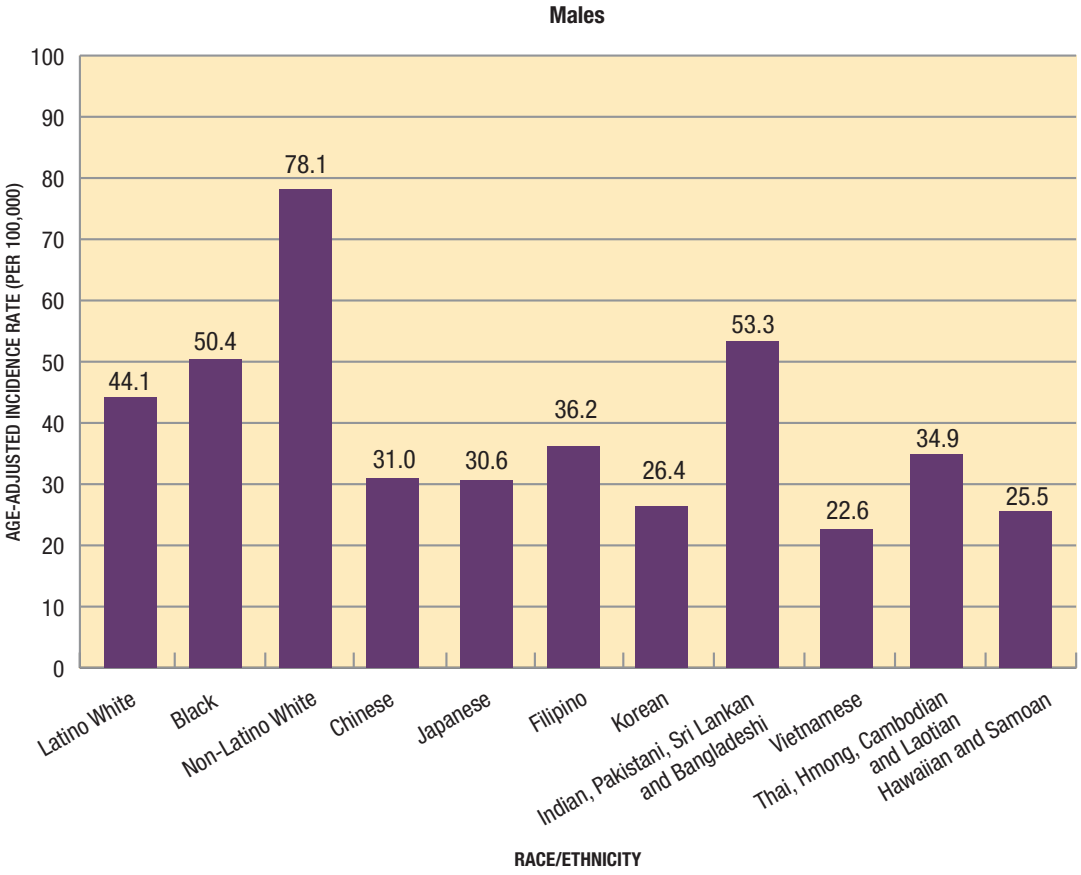
Testicular cancers and lymphomas are the most common cancers among male 15 to 24 year olds. Kaposi's sarcoma and testicular cancers are the most common among male 25 to 34 year olds. Kaposi's sarcoma and lymphomas are the most common among male 35 to 39 year olds. Among all male AYA ages combined, lymphomas and testicular cancers are the most common.

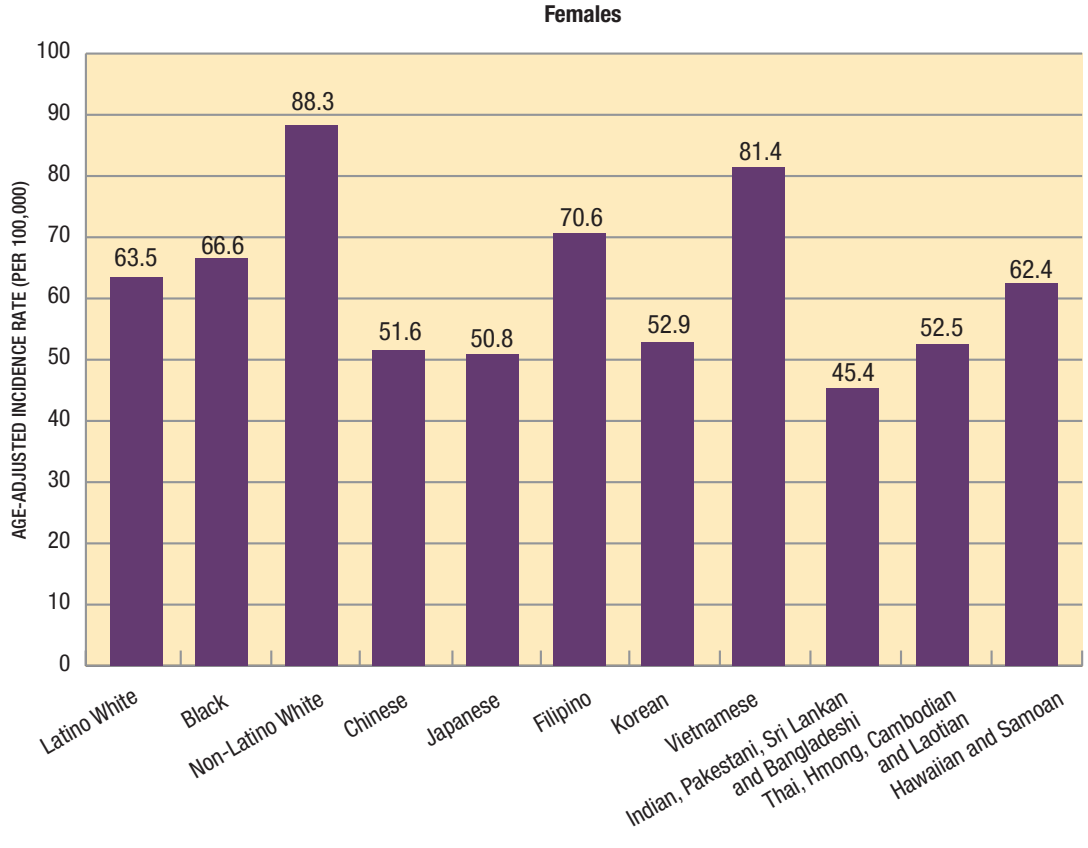
AGE-ADJUSTED INCIDENCE RATES PER 100,000 PERSONS BY SITE AMONG ADOLESCENTS AND YOUNG ADULTS IN LOS ANGELES COUNTY, 1988-2011



ALL: Acute Lymphoid Leukemia
AML: Acute Myeloid Leukemia
KS: Kaposi's Sarcoma
NHL: Non-Hodgkin Lymphoma
HD: Hodgkin Disease

AGE-ADJUSTED INCIDENCE RATES PER 100,000 PERSONS OF ALL CANCER COMBINED AMONG ADOLESCENTS AND YOUNG ADULTS BY SEX AND RACIAL/ETHNIC GROUP IN LOS ANGELES COUNTY, 1988-2011



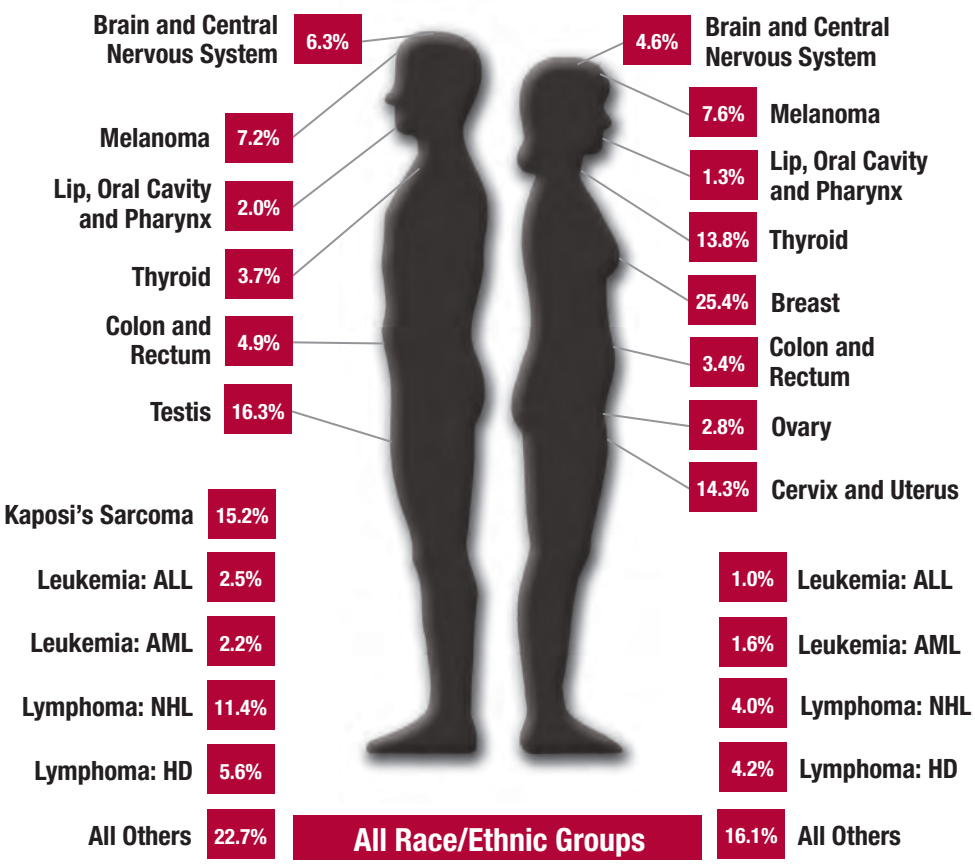


DISTRIBUTION OF ALL CANCERS COMBINED BY ANATOMIC SITE, SEX AND RACE/ETHNICITY

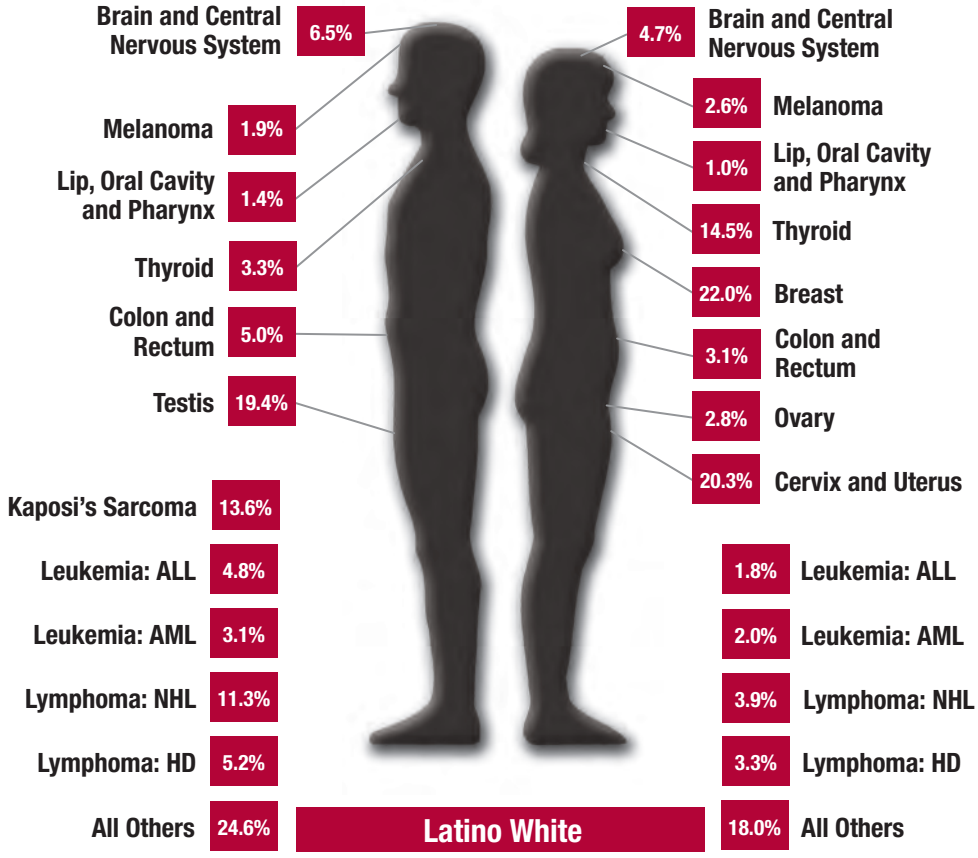
In this section we provide an overview of the distribution of cancers among AYAs from 1988 to 2011 in Los Angeles County, according to the site on the body where they occur (anatomic site). In the following pages we present figures for males and females separately, by age group and by race/ethnicity. The numbers presented are percentages of all cancers combined, and only the most common anatomic sites are included in the figures.

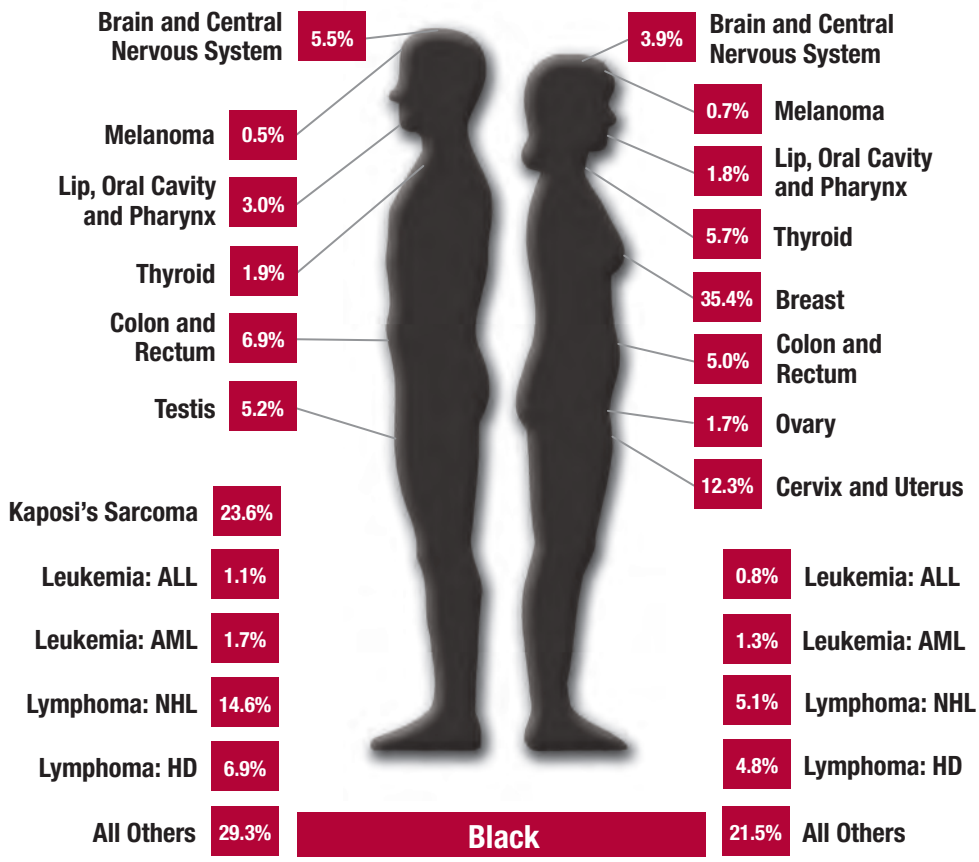
BY SEX AND RACE/ETHNICITY (ALL AYA AGES COMBINED)

Breast cancer is the most common cancer among females regardless of race/ethnicity. The second most common cancer among non-Latina females is melanoma, but for Latina white and black females the second most common cancer is cervix/uterus. Among non-Latino white males, lymphomas are the most common. Among Latino white males, testicular cancers are the most common. Among black males, Kaposi's sarcomas are the most common.

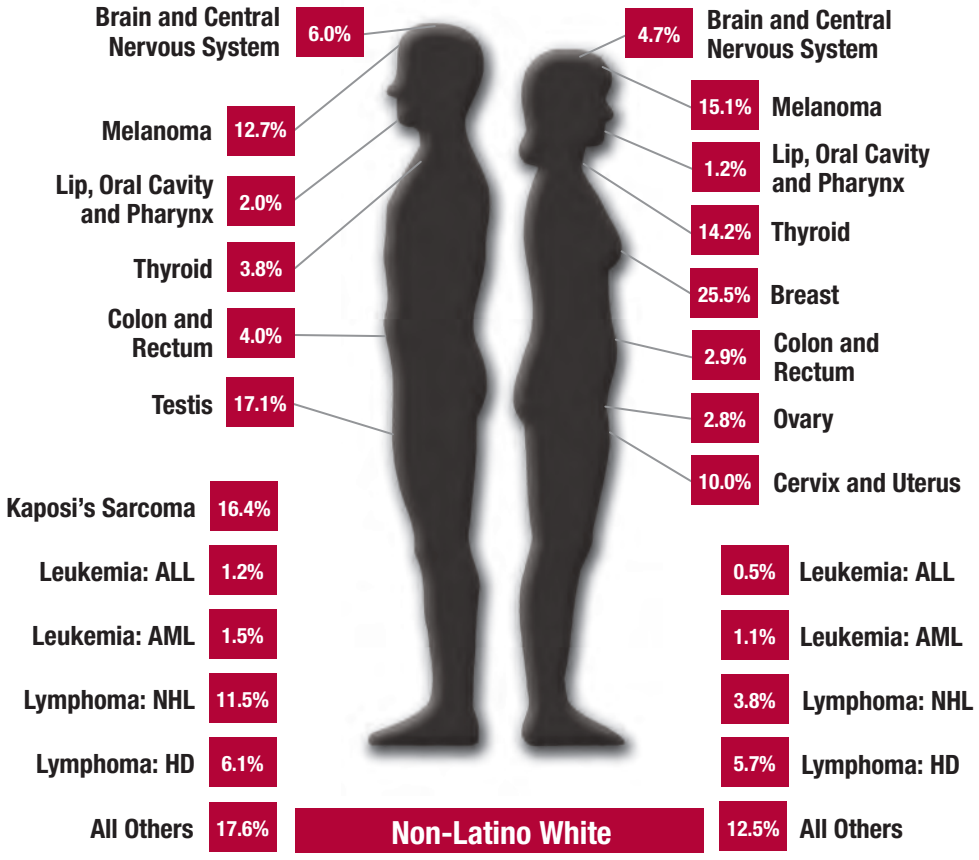


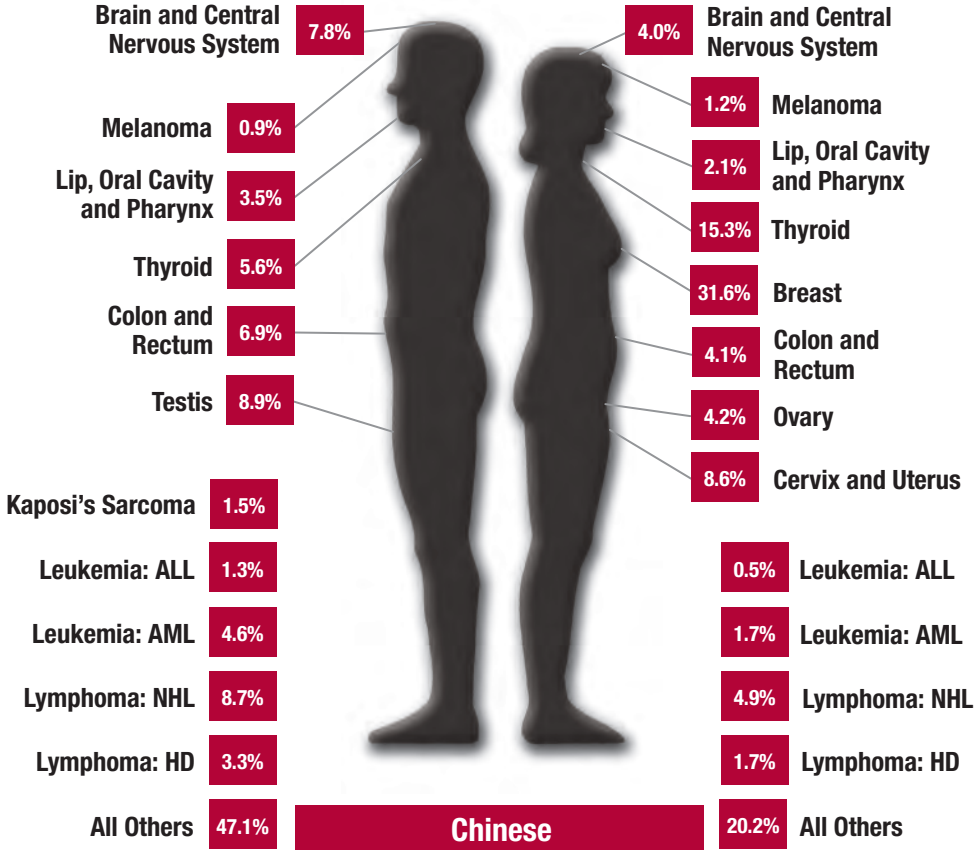
ALL: Acute Lymphoid Leukemia
AML: Acute Myeloid Leukemia
NHL: Non-Hodgkin Lymphoma
HD: Hodgkin Disease



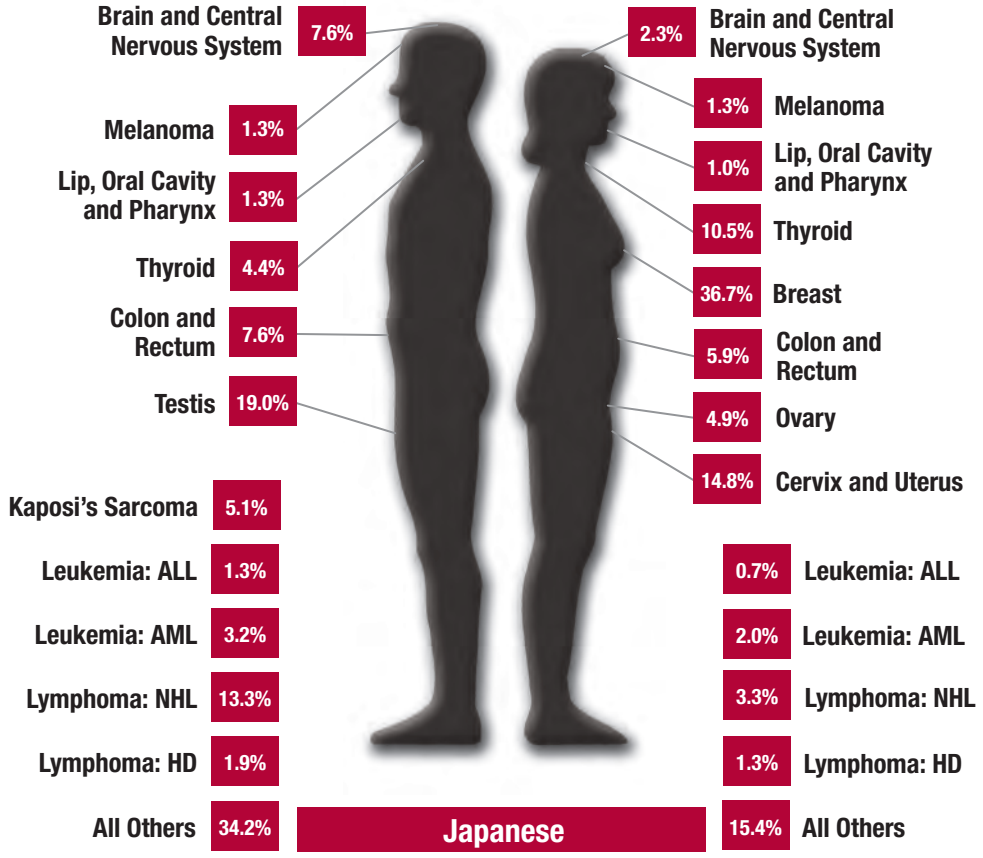


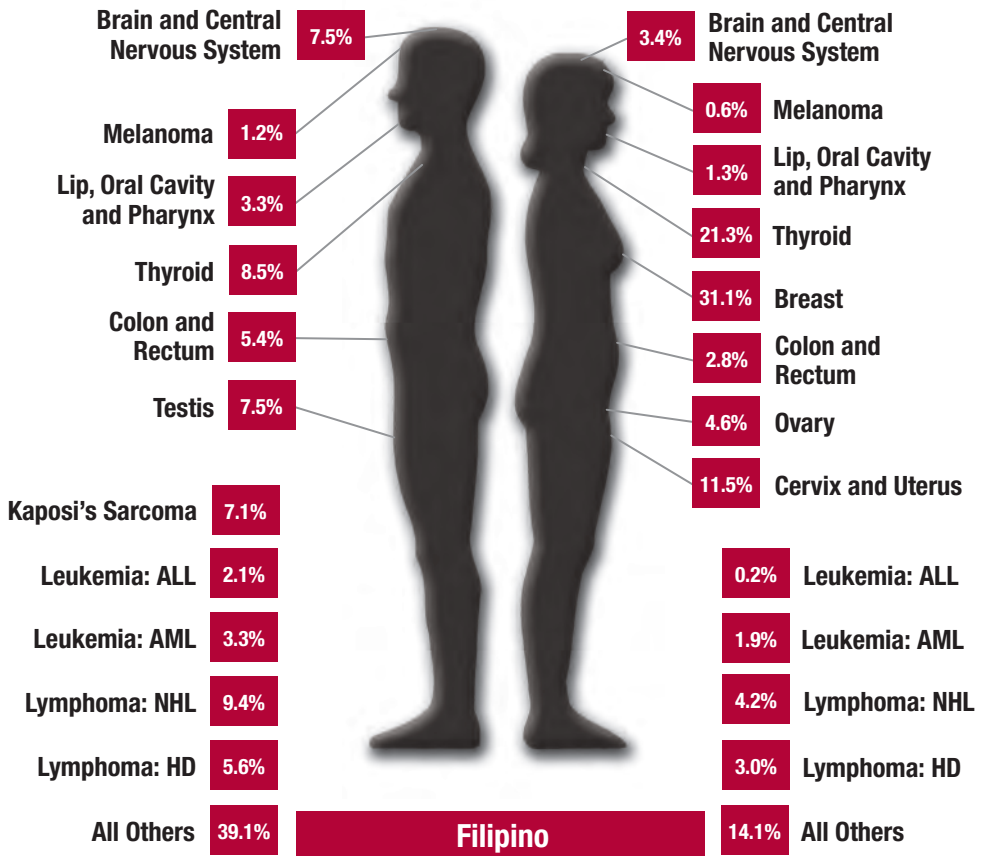
ALL: Acute Lymphoid Leukemia
AML: Acute Myeloid Leukemia
NHL: Non-Hodgkin Lymphoma
HD: Hodgkin Disease



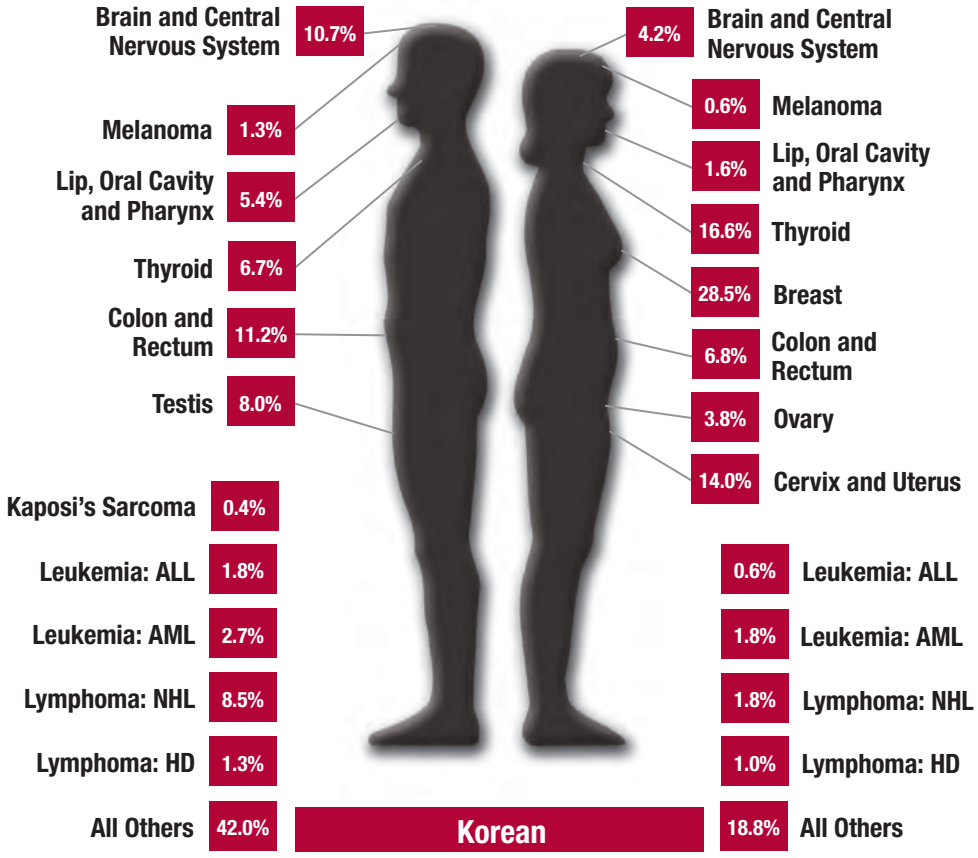


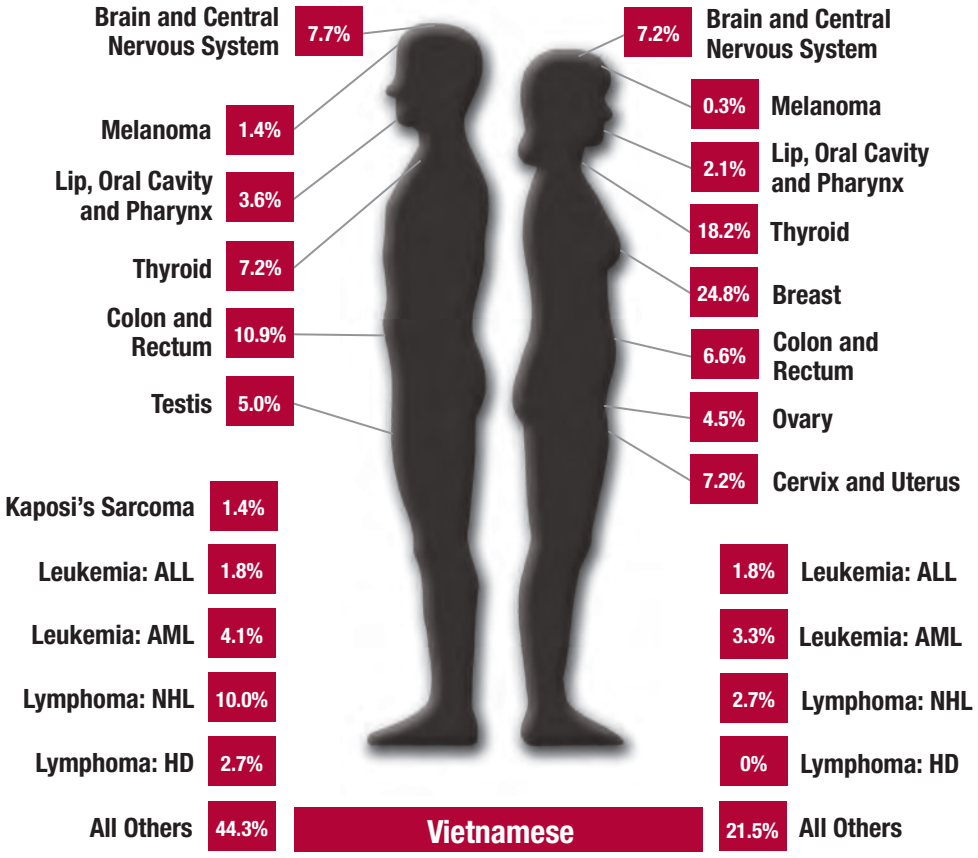
ALL: Acute Lymphoid Leukemia
AML: Acute Myeloid Leukemia
NHL: Non-Hodgkin Lymphoma
HD: Hodgkin Disease



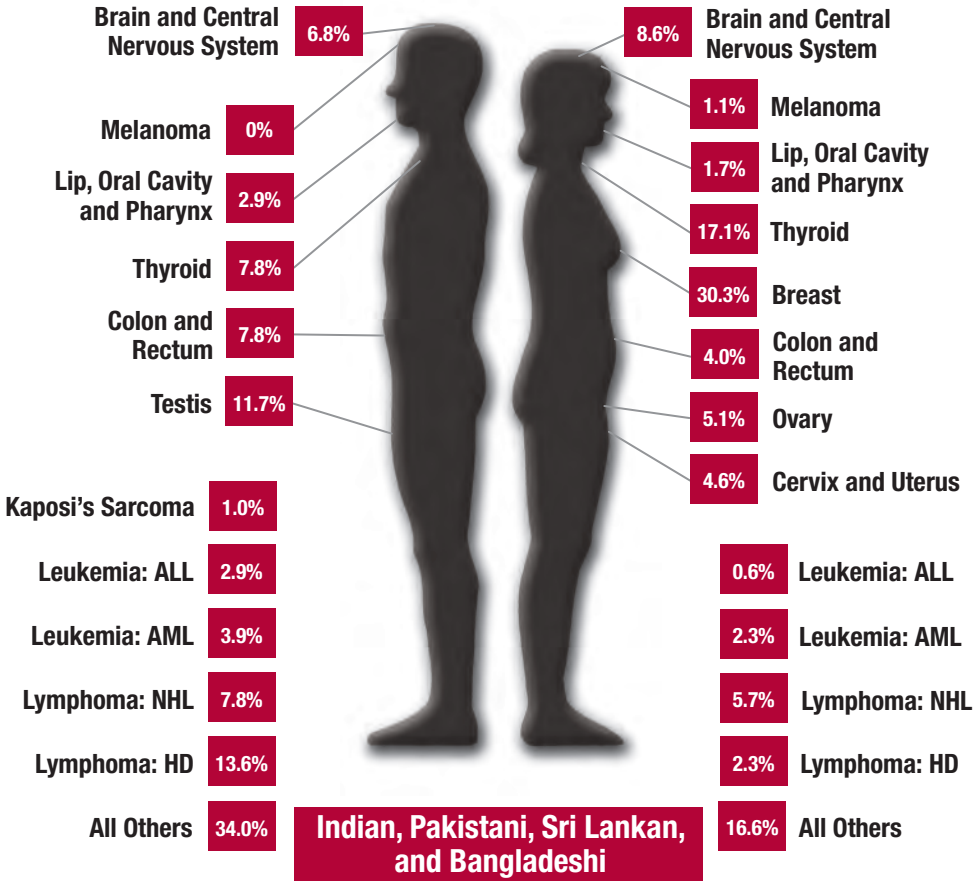


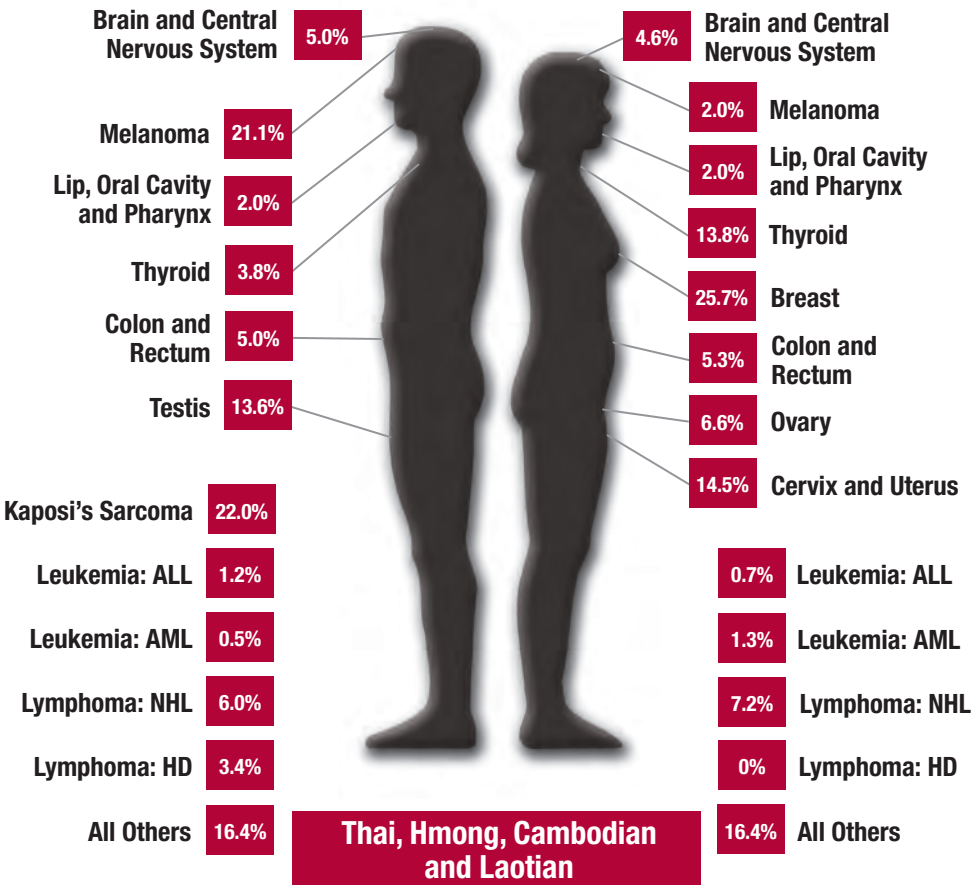
ALL: Acute Lymphoid Leukemia
AML: Acute Myeloid Leukemia
NHL: Non-Hodgkin Lymphoma
HD: Hodgkin Disease



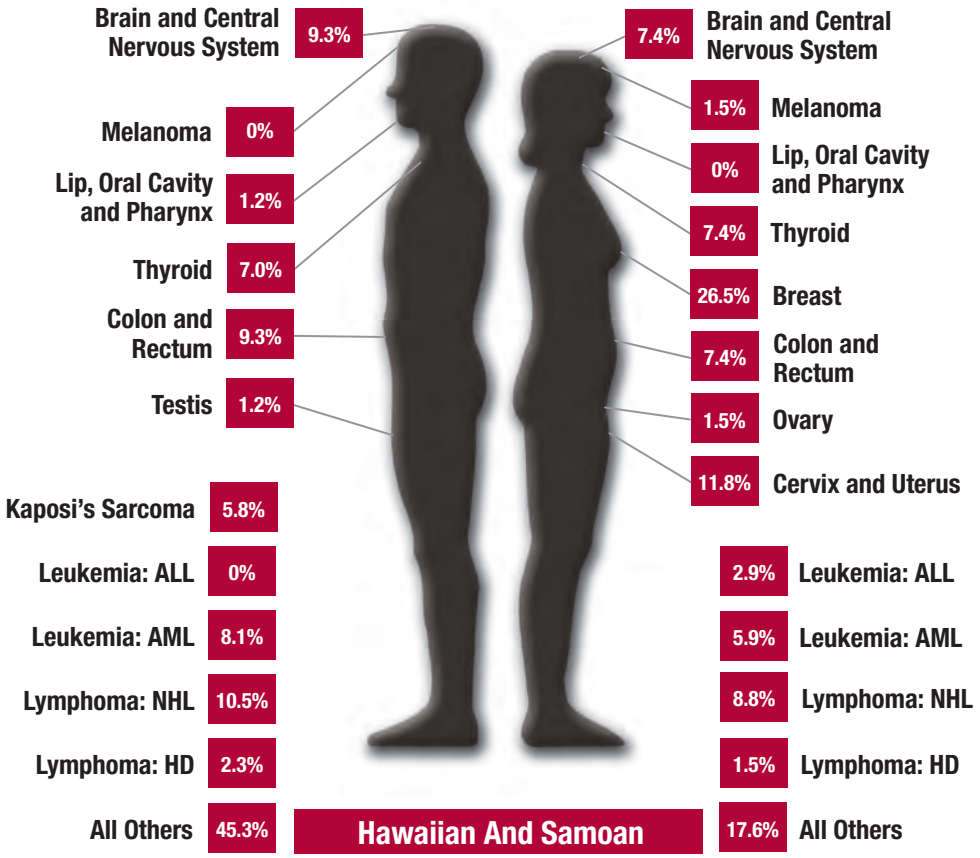


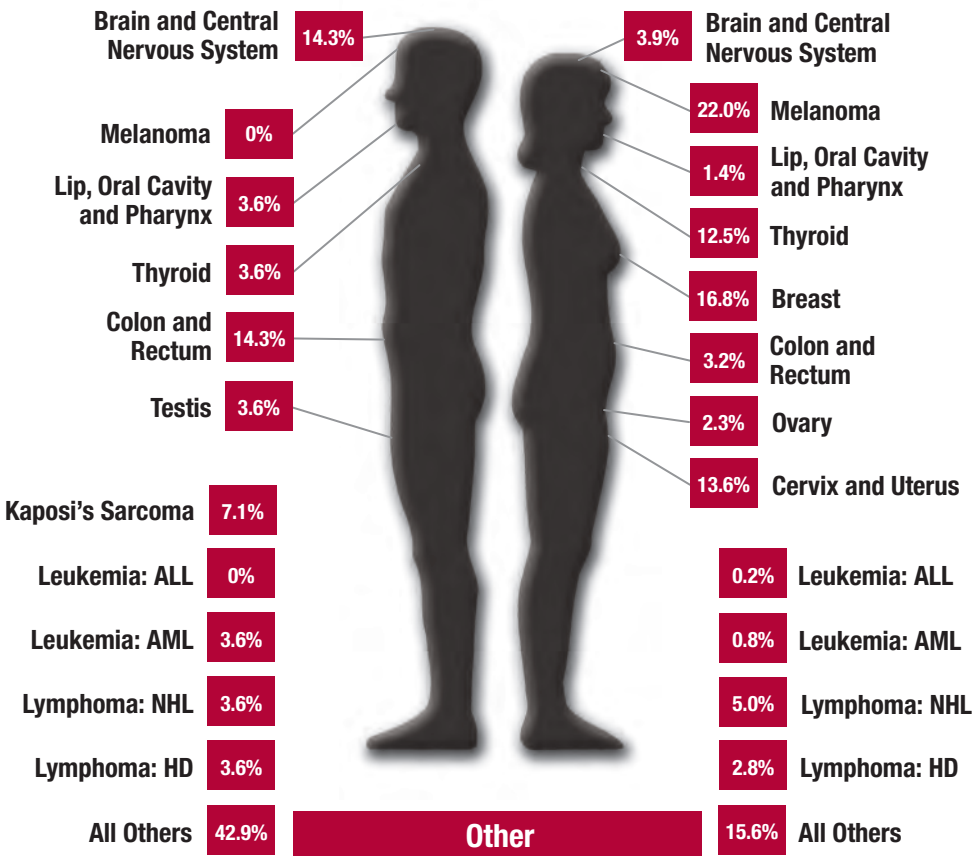
ALL: Acute Lymphoid Leukemia
AML: Acute Myeloid Leukemia
NHL: Non-Hodgkin Lymphoma
HD: Hodgkin Disease





ALL: Acute Lymphoid Leukemia
AML: Acute Myeloid Leukemia
NHL: Non-Hodgkin Lymphoma
HD: Hodgkin Disease





ALL: Acute Lymphoid Leukemia
AML: Acute Myeloid Leukemia
NHL: Non-Hodgkin Lymphoma
HD: Hodgkin Disease

BONE SARCOMAS

Leo Mascarenhas, MD, MS

There are approximately 3,020 new cases of cancers arising in bones and joints that occur each year in the U.S. among all ages, accounting for 0.2% of all cancers. Approximately 1,460 individuals die from these cancers accounting for 0.2% of deaths from all cancers. The most common subtypes of bone cancers are osteosarcoma, Ewing sarcoma/peripheral primitive neuroectodermal tumor (also called Ewing sarcoma family of tumors (ESFT)), chondrosarcoma and malignant fibrous histiocytoma. The most common bone cancer is osteosarcoma followed by ESFT. Bone sarcomas account for approximately 3% of all cancers between the ages of 15-29 years and with approximately 27% occurring before age 20.

There are several risk factors for developing osteosarcoma including past treatment with radiation therapy and chemotherapy drugs called alkylating agents. Individuals with certain conditions such as hereditary retinoblastoma, Paget's disease, Diamond-Black anemia, Li-Fraumeni syndrome, Rothmund-Thompson syndrome, Bloom syndrome and Werner syndrome have increased risk of osteosarcoma. No known risk factors for ESFT have been identified.

RATES BY AGE AND SEX AND TIME TRENDS

In Los Angeles County, there were 358 new cases of osteosarcoma and 213 ESFT diagnosed in AYAs between 1988-2011. 227 (63%) were less than 25 years of age (Tables 1, pg. 26, 30). The highest incidence of osteosarcoma in the AYA population is between 15-24 years of age for both males and females (Table 1, pg. 26). There appears to be a slight increase in osteosarcoma in the 15-24 year age group for both males and females between 2002-2006 (Figure 3, pg. 27). There is a slight excess of males over females for whites (Table 2, pg. 26).

The highest incidence of ESFT in AYAs is also between 15-24 years of age for both genders (Figure 3, pg. 31). The rate of ESFT for males between the ages of 15-24 years has remained constant over the last 24 years while there appears to be a slight increase in the rate for females in the same ages between 2002-2006 (Figure 3, pg. 31).

RATES BY RACE/ETHNICITY, SOCIOECONOMIC STATUS AND BIRTHPLACE

Incidence rates of these tumors are very low with relatively small differences observed by race/ethnicity; for most groups, the numbers of cases are too low to provide reliable rates (Tables 2 pg. 26, 30).

SES does not appear to influence the rate of osteosarcoma. There appears to be a trend for a higher incidence of ESFT in more affluent AYAs. Birth place information was available for 89% of AYA osteosarcoma cases (Figure 6, pg. 29). 36% were foreign born with the majority originating from Mexico. The majority of US born AYAs with osteosarcoma in Los Angeles County were born in California. Birth place information is available for approximately 87% of AYA with ESFT (Figure 6, pg. 33). 46% were foreign born and with the majority hailing from Mexico. Most of the U.S. born ESFT patients are born in California.

RATES BY STAGE AT DIAGNOSIS

Staging information is available in 95% of osteosarcoma AYA cases. 15% of osteosarcoma presented with distant metastases and the distribution was similar for males and females (Figure 7, pg. 29). In contrast, a third of the AYA patients diagnosed with ESFT in Los Angeles County presented with distant metastases. There was no difference in the incidence of distant metastases in AYA patients with ESFT based on gender (Figure 7, pg. 33).

TABLE 1.
AGE-ADJUSTED INCIDENCE RATE BY AGE FOR AYA OSTEOSARCOMA IN LOS ANGELES COUNTY, 1988-2011

	Males		Females	
Age Group	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
15-24	139	0.8 (0.7–0.9)	88	0.6 (0.4–0.7)
25-34	55	0.3 (0.2–0.4)	50	0.3 (0.2–0.3)
35-39	<20	—	<20	—
All Ages 15-39	**207**	**0.5 (0.4–0.5)**	**151**	**0.3 (0.3–0.4)**

TABLE 2. AGE-ADJUSTED INCIDENCE RATE BY AGE AND RACE/ETHNICITY FOR AYA OSTEOSARCOMA IN LOS ANGELES COUNTY, 1988-2011

MALES								
	All Ages 15-24		**All Ages 25-34**		**All Ages 35-39**		**All Ages 15-39**	
Race/Ethnicity	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
Latino White	79	0.9 (0.7-1.1)	25	0.3 (0.2-0.4)	<20	—	110	0.5 (0.4-0.6)
Black	<20	—	<20	—	<20	—	<20	—
Non-Latino White	33	0.8 (0.5-1.1)	<20	—	<20	—	49	0.4 (0.3-0.5)
Chinese	<20	—	<20	—	<20	—	<20	—
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	<20	—
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—
FEMALES								
Latino White	45	0.6 (0.4-0.7)	<20	—	<20	—	68	0.3 (0.3-0.4)
Black	<20	—	<20	—	<20	—	23	0.5 (0.3-0.7)
Non-Latino White	23	0.6 (0.3-0.8)	20	0.3 (0.2-0.5)	<20	—	45	0.4 (0.3-0.5)
Chinese	<20	—	<20	—	<20	—	<20	—
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	<20	—
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—

FIGURE 1. AGE-SPECIFIC RATE BY SEX FOR AYA OSTEOSARCOMA IN LOS ANGELES COUNTY, 1988-2011

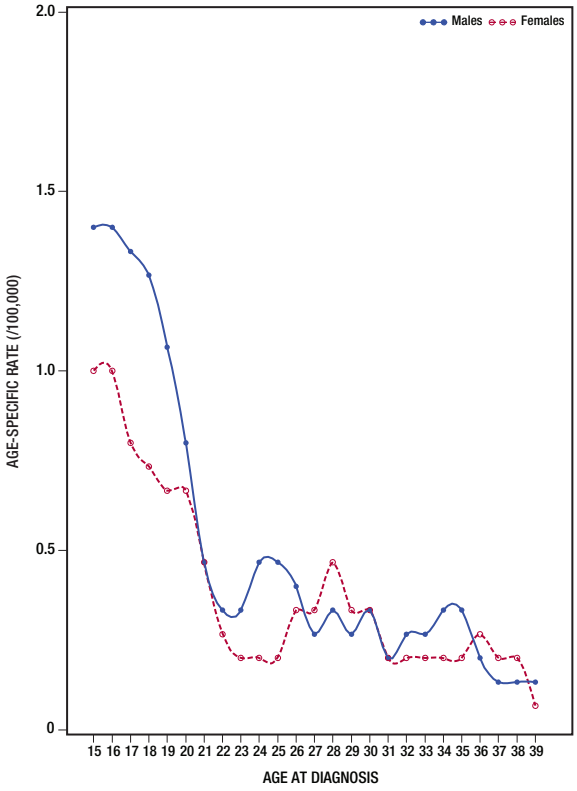


FIGURE 2. TREND IN AGE-ADJUSTED INCIDENCE RATE BY SEX FOR AYA OSTEOSARCOMA IN LOS ANGELES COUNTY, 1988-2011

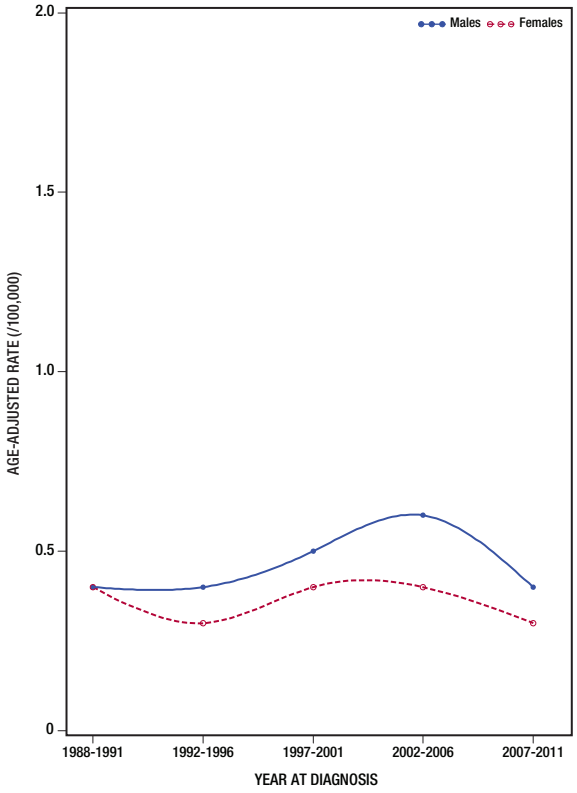


FIGURE 3. TREND IN AGE-SPECIFIC RATE BY SEX FOR AYA OSTEOSARCOMA IN LOS ANGELES COUNTY, 1988-2011

FIG 3(A): MALES

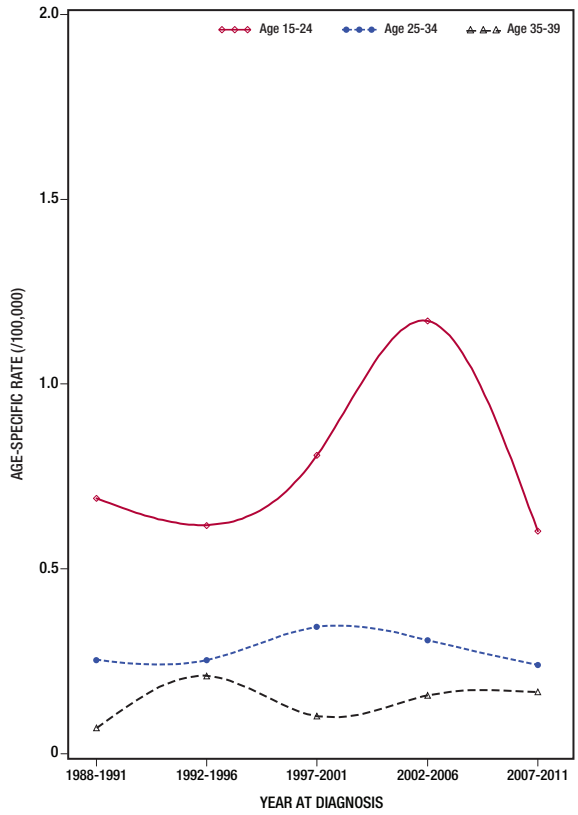


FIG 3(B): FEMALES

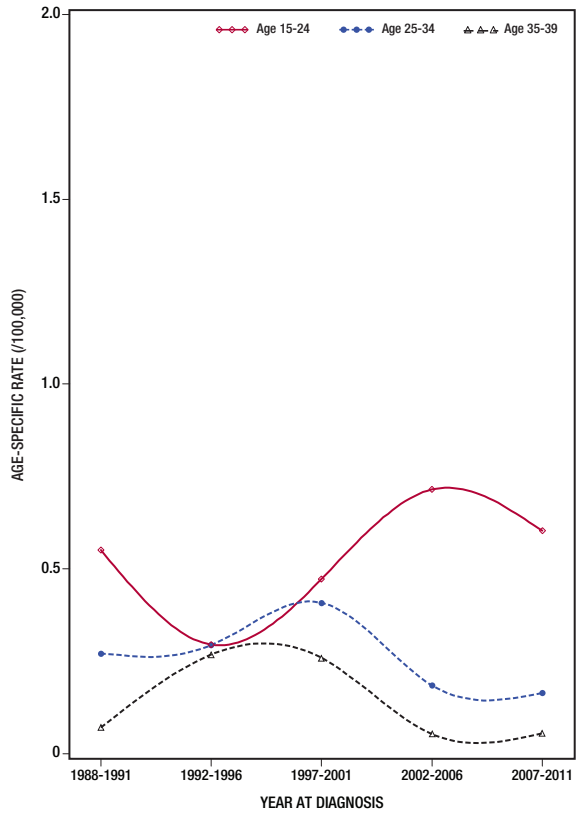


FIGURE 4. AGE-ADJUSTED INCIDENCE RATE BY RACE/ETHNICITY FOR AYA OSTEOSARCOMA IN LOS ANGELES COUNTY, 1988-2011

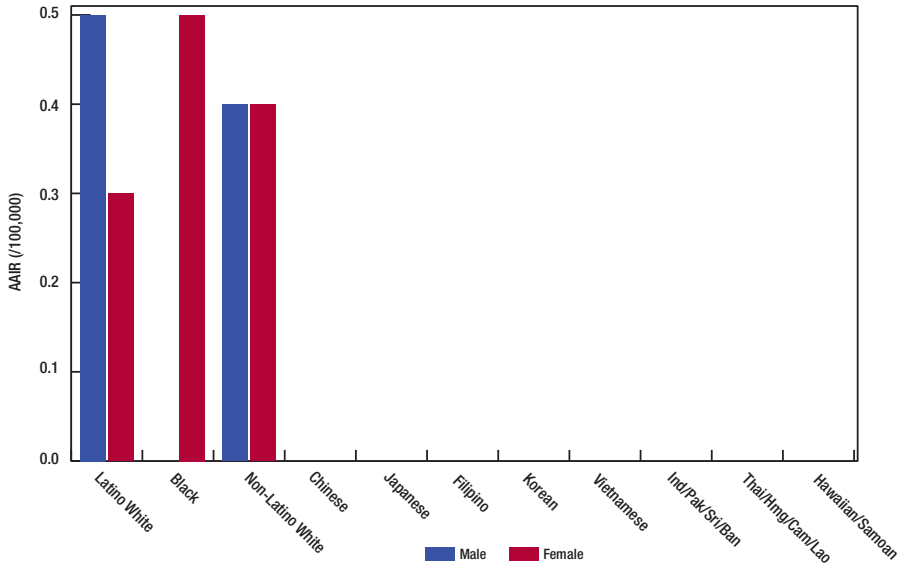


FIGURE 5. AGE-ADJUSTED INCIDENCE RATE BY SES BY RACE/ETHNICITY FOR AYA OSTEOSARCOMA IN LOS ANGELES COUNTY, 1988-2011

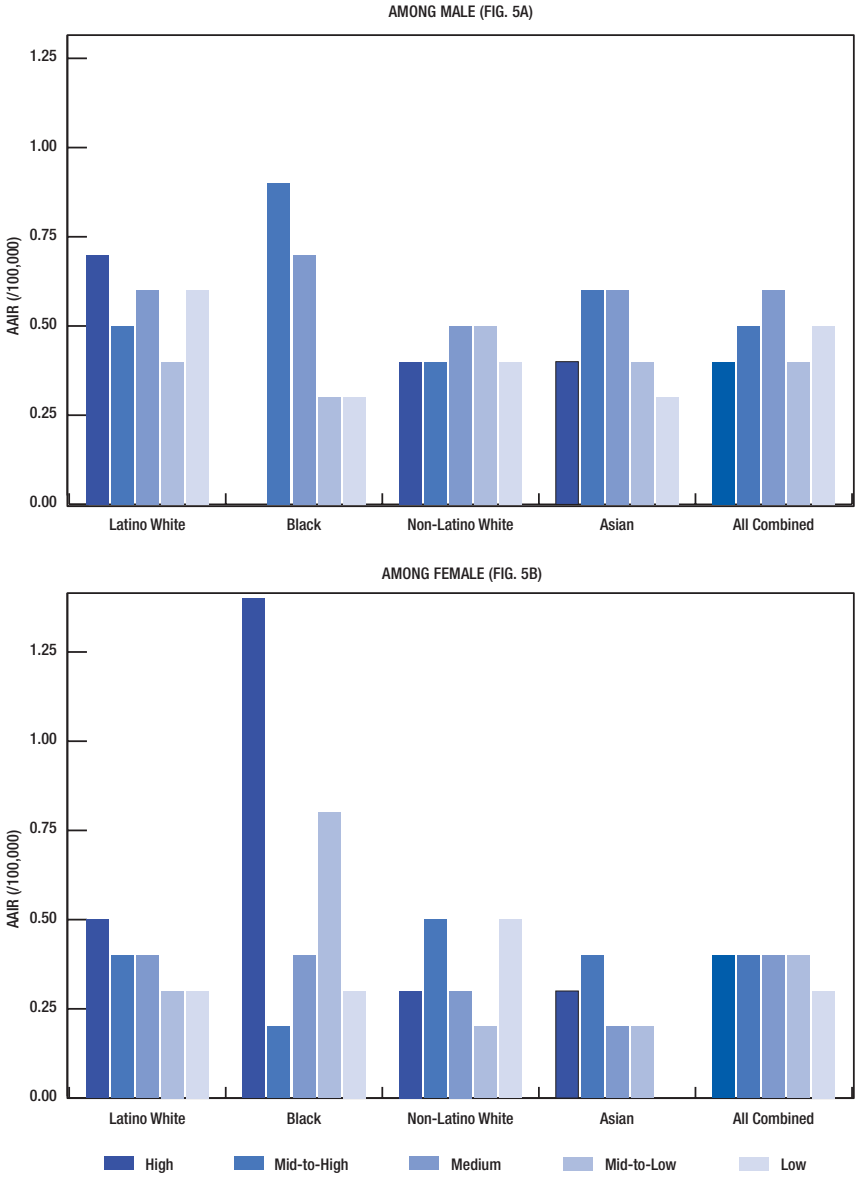
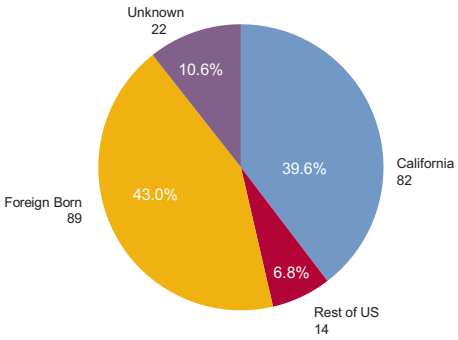
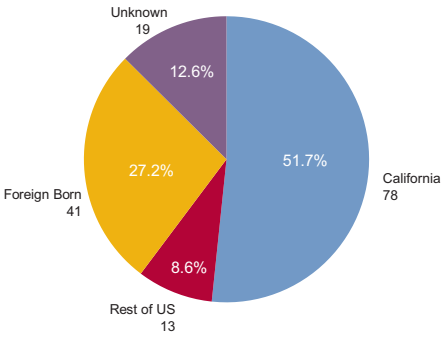


FIGURE 6. FREQUENCY DISTRIBUTION OF BIRTH PLACE FOR AYA OSTEOSARCOMA BY SEX IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 6A)

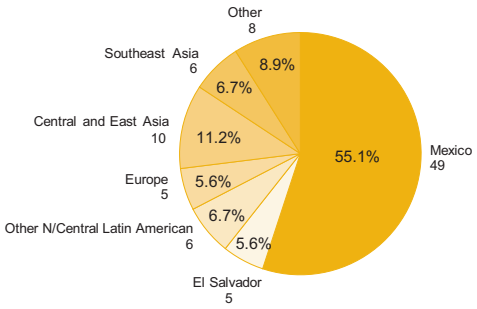


FEMALE (FIG. 6B)



AMONG FOREIGN BORN

MALE (FIG. 6C)



FEMALE (FIG. 6D)

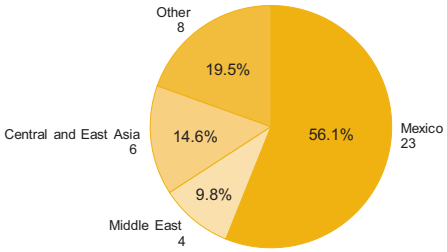
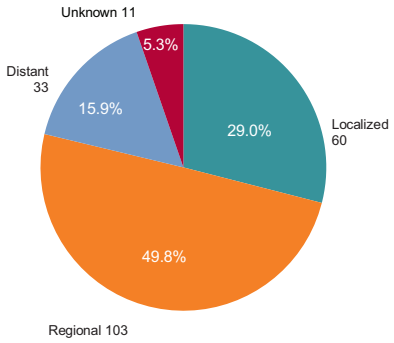


FIGURE 7. FREQUENCY DISTRIBUTION OF STAGE OF DISEASE BY SEX FOR AYA OSTEOSARCOMA IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 7A)



FEMALE (FIG. 7B)

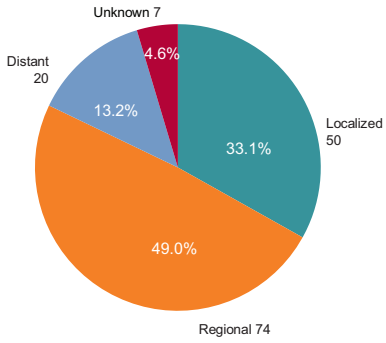


TABLE 1.
AGE-ADJUSTED INCIDENCE RATE BY AGE FOR AYA EWING TUMOR IN LOS ANGELES COUNTY, 1988-2011

	Males		Females	
Age Group	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
15-24	80	0.5 (0.4–0.6)	54	0.3 (0.2–0.4)
25-34	40	0.2 (0.1–0.3)	<20	—
35-39	<20	—	<20	—
All Ages 15-39	**129**	**03 (0.2–0.3)**	**84**	**0.2 (0.2–0.2)**

TABLE 2. AGE-ADJUSTED INCIDENCE RATE BY AGE AND RACE/ETHNICITY FOR AYA EWING TUMOR IN LOS ANGELES COUNTY, 1988-2011

MALES								
	All Ages 15-24		**All Ages 25-34**		**All Ages 35-39**		**All Ages 15-39**	
Race/Ethnicity	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
Latino White	46	0.5 (0.4-0.7)	<20	—	<20	—	62	0.3 (0.2-0.3)
Black	<20	—	<20	—	<20	—	<20	—
Non-Latino White	28	0.7 (0.4-0.9)	20	0.3 (0.2-0.5)	<20	—	53	0.4 (0.3-0.5)
Chinese	<20	—	<20	—	<20	—	<20	—
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	<20	—
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—
FEMALES								
Latino White	24	0.3 (0.2-0.4)	<20	—	<20	—	39	0.2 (0.1-0.3)
Black	<20	—	<20	—	<20	—	<20	—
Non-Latino White	26	0.6 (0.4-0.9)	<20	—	<20	—	37	0.3 (0.2-0.4)
Chinese	<20	—	<20	—	<20	—	<20	—
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	<20	—
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—

FIGURE 1. AGE-SPECIFIC RATE BY SEX FOR AYA EWING SARCOMA IN LOS ANGELES COUNTY, 1988-2011

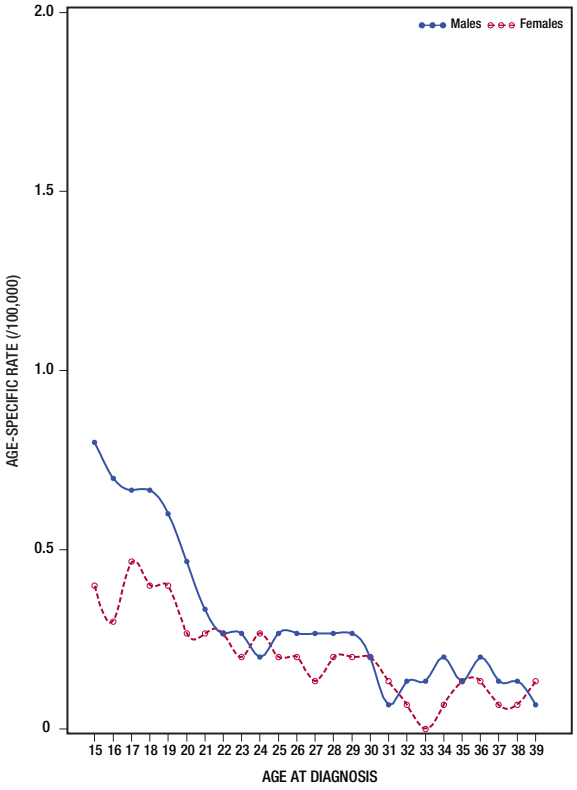


FIGURE 2. TREND IN AGE-ADJUSTED INCIDENCE RATE BY SEX FOR AYA EWING SARCOMA IN LOS ANGELES COUNTY, 1988-2011

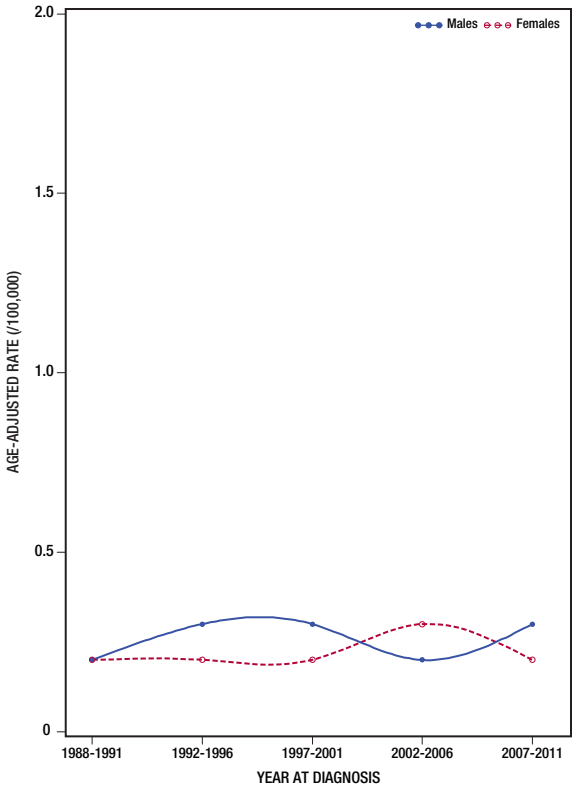


FIGURE 3. TREND IN AGE-SPECIFIC RATE BY SEX FOR AYA EWING SARCOMA IN LOS ANGELES COUNTY, 1988-2011

FIG 3(A): MALES

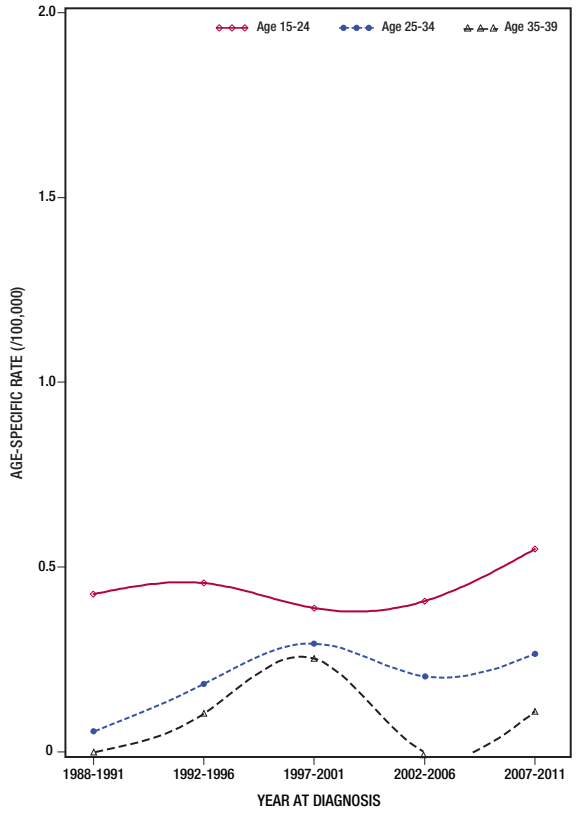


FIG 3(B): FEMALES

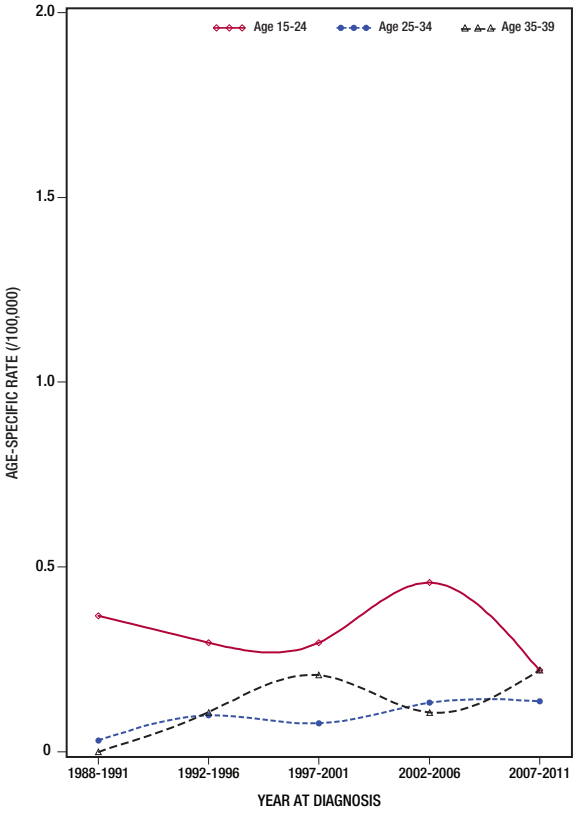


FIGURE 4. AGE-ADJUSTED INCIDENCE RATE BY RACE/ETHNICITY FOR AYA EWING TUMOR IN LOS ANGELES COUNTY, 1988-2011

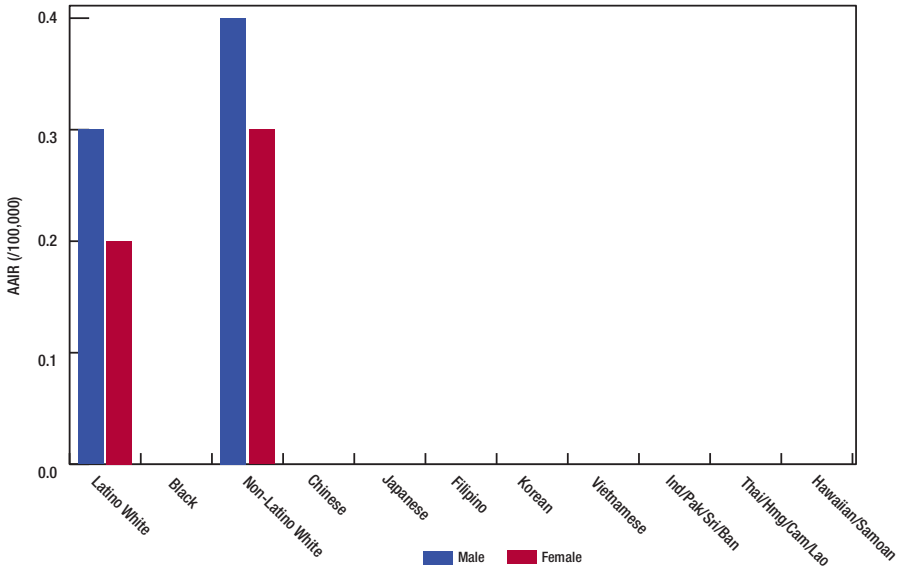
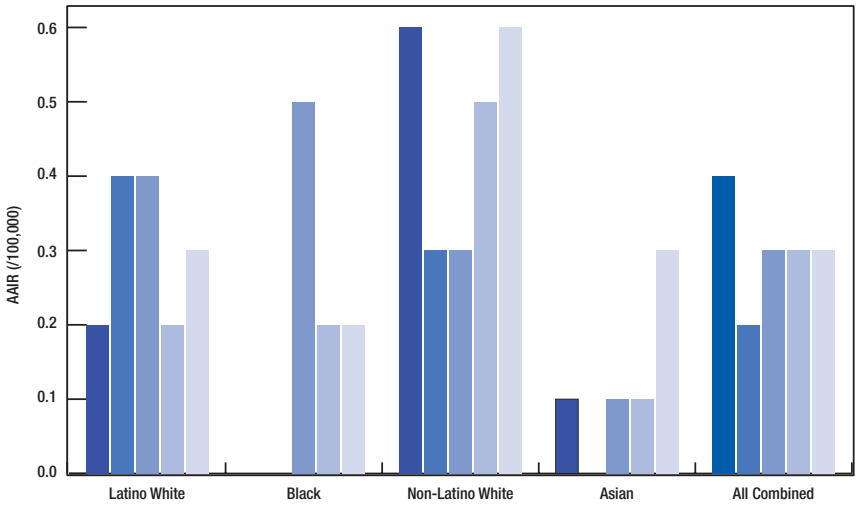


FIGURE 5. AGE-ADJUSTED INCIDENCE RATE BY SES BY RACE/ETHNICITY FOR AYA EWING TUMOR IN LOS ANGELES COUNTY, 1988-2011

AMONG MALE (FIG. 5A)



AMONG FEMALE (FIG. 5B)

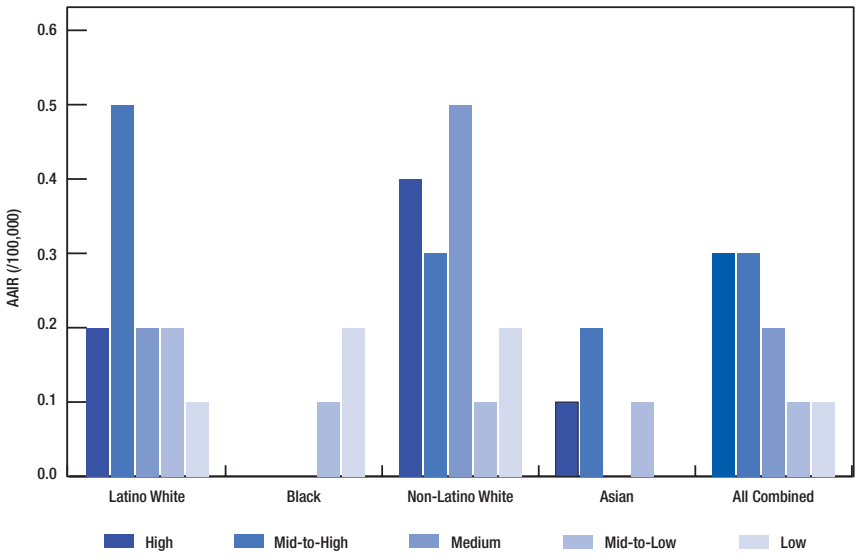
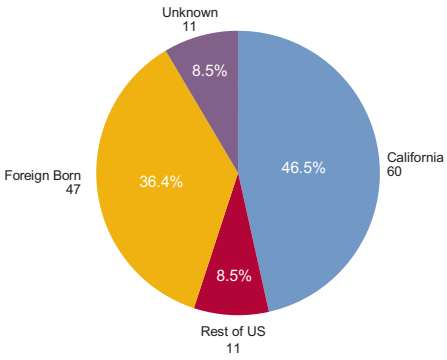
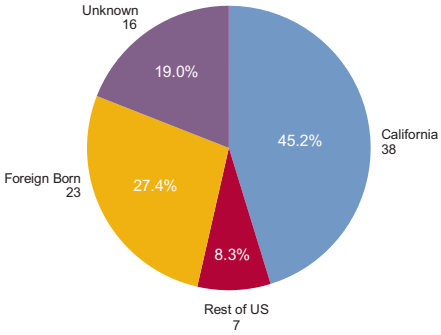


FIGURE 6. FREQUENCY DISTRIBUTION OF BIRTH PLACE FOR AYA EWING TUMOR BY SEX IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 6A)

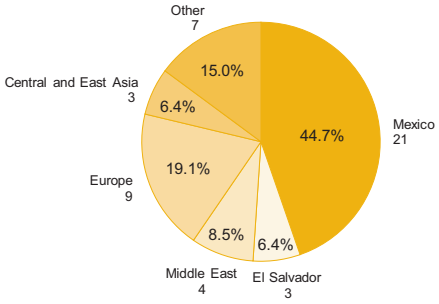


FEMALE (FIG. 6B)



AMONG FOREIGN BORN

MALE (FIG. 6C)



FEMALE (FIG. 6D)

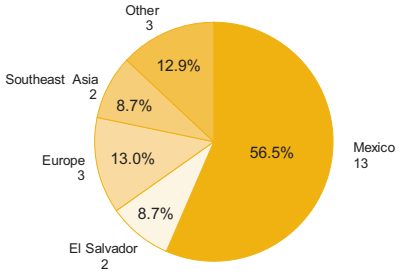
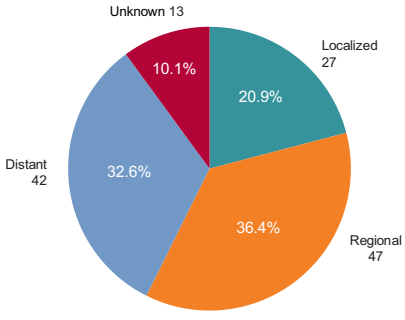


FIGURE 7. FREQUENCY DISTRIBUTION OF STAGE OF DISEASE BY SEX FOR AYA EWING TUMOR IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 7A)



FEMALE (FIG. 7B)

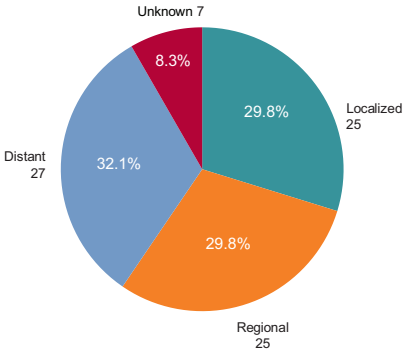


TABLE 1.
AGE-ADJUSTED INCIDENCE RATE BY AGE FOR AYA OTHER SOFT TISSUE SARCOMA (EXCL KAPOSI'S SARCOMA) IN LOS ANGELES COUNTY, 1988-2011

	Males		Females	
Age Group	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
15-24	106	0.6 (0.5–0.7)	105	0.6 (0.5–0.7)
25-34	202	1.0 (0.9–1.2)	199	1.1 (0.9–1.2)
35-39	155	1.7 (1.4–2.0)	182	2.0 (1.7–2.3)
All Ages 15-39	**463**	**1.0 (0.9–1.1)**	**486**	**1.1 (1.0–1.2)**

TABLE 2. AGE-ADJUSTED INCIDENCE RATE BY AGE AND RACE/ETHNICITY FOR AYA OTHER SOFT TISSUE SARCOMA (EXCL KAPOSI'S SARCOMA) IN LOS ANGELES COUNTY, 1988-2011

MALES								
	All Ages 15-24		**All Ages 25-34**		**All Ages 35-39**		**All Ages 15-39**	
Race/Ethnicity	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
Latino White	54	0.6 (0.4-0.7)	89	1.0 (0.8-1.2)	60	1.6 (1.2-2.0)	203	1.0 (0.8-1.1)
Black	<20	—	<20	—	<20	—	55	1.3 (1.0-1.7)
Non-Latino White	22	0.5 (0.3-0.7)	74	1.2 (0.9-1.5)	62	1.9 (1.5-2.4)	158	1.1 (0.9-1.3)
Chinese	<20	—	<20	—	<20	—	<20	—
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	<20	—
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—
FEMALES								
Latino White	52	0.6 (0.4-0.8)	84	1.0 (0.8-1.3)	80	2.2 (1.8-2.7)	216	1.1 (1.0-1.3)
Black	<20	—	30	1.6 (1.0-2.1)	29	3.0 (1.9-4.1)	68	1.5 (1.1-1.8)
Non-Latino White	32	0.7 (0.5-1.0)	69	1.2 (0.9-1.5)	59	2.0 (1.5-2.5)	160	1.2 (1.0-1.4)
Chinese	<20	—	<20	—	<20	—	<20	—
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	<20	—
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—

FIGURE 1. AGE-SPECIFIC RATE BY SEX FOR AYA OTHER SOFT TISSUE SARCOMA (EXCL KAPOSI'S SARCOMA) IN LOS ANGELES COUNTY, 1988-2011

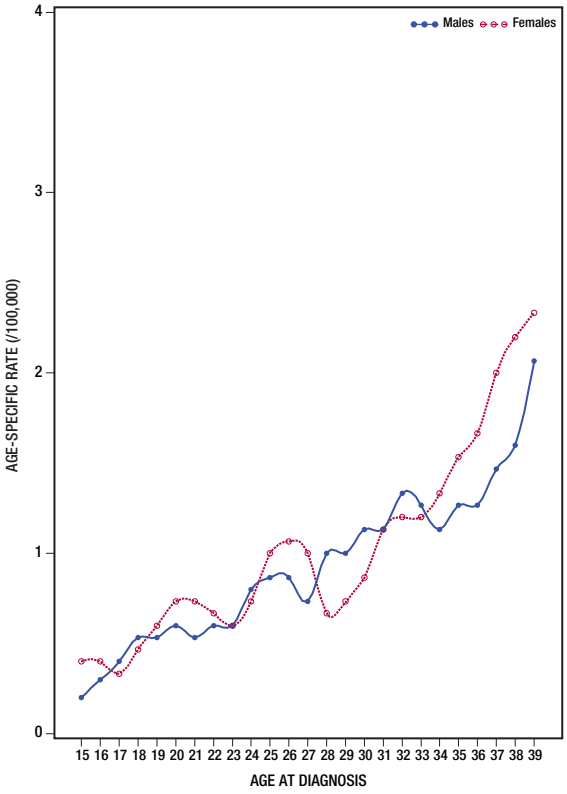


FIGURE 2. TREND IN AGE-ADJUSTED INCIDENCE RATE BY SEX FOR AYA OTHER SOFT TISSUE SARCOMA (EXCL KAPOSI'S SARCOMA) IN LOS ANGELES COUNTY, 1988-2011

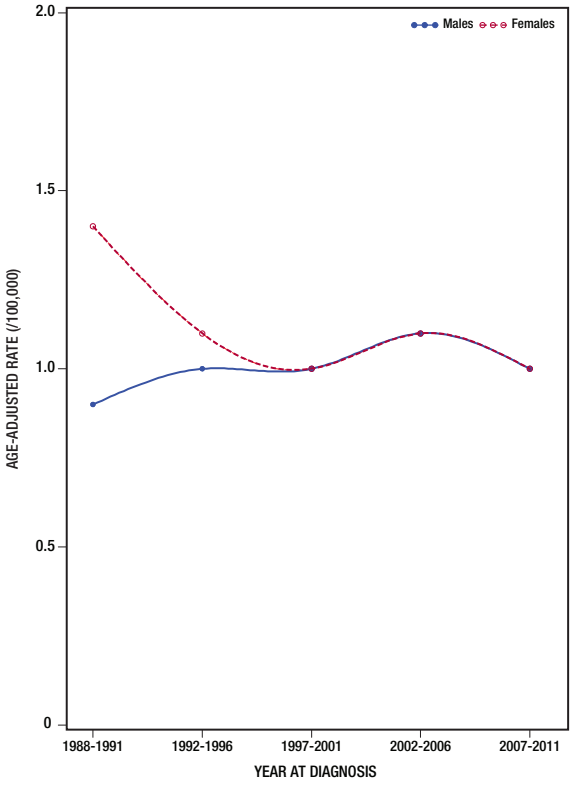


FIGURE 3. TREND IN AGE-SPECIFIC RATE BY SEX FOR AYA OTHER SOFT TISSUE SARCOMA (EXCL KAPOSI'S SARCOMA) IN LOS ANGELES COUNTY, 1988-2011

FIG 3(A): MALES

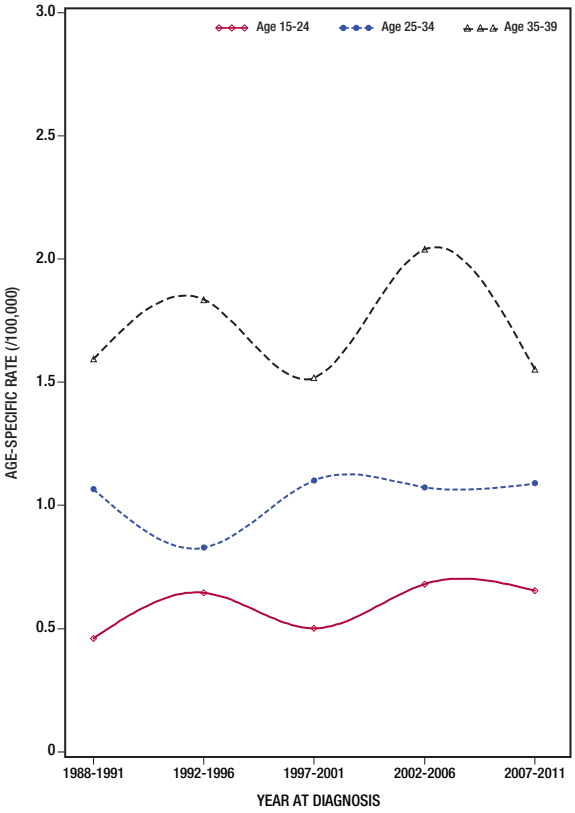


FIG 3(B): FEMALES

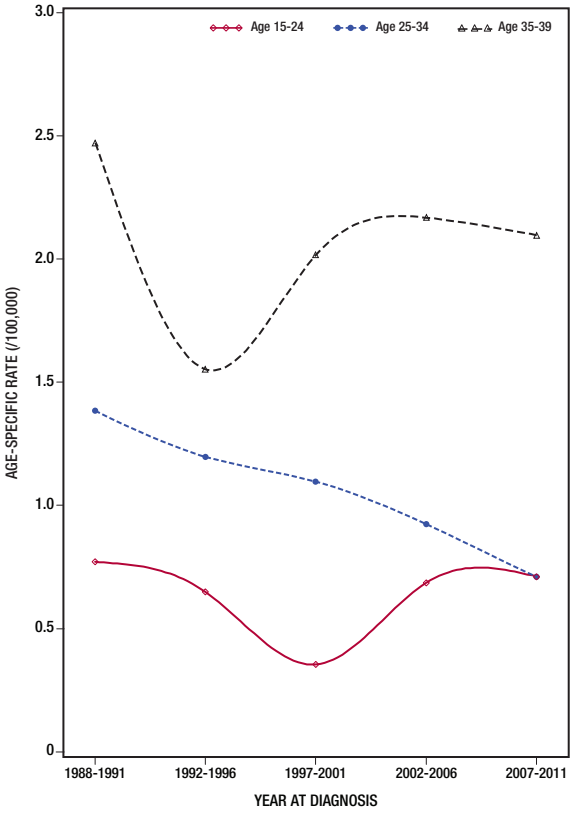


FIGURE 4. AGE-ADJUSTED INCIDENCE RATE BY RACE/ETHNICITY FOR AYA OTHER SOFT TISSUE SARCOMA (EXCL KAPOSI'S SARCOMA) IN LOS ANGELES COUNTY, 1988-2011

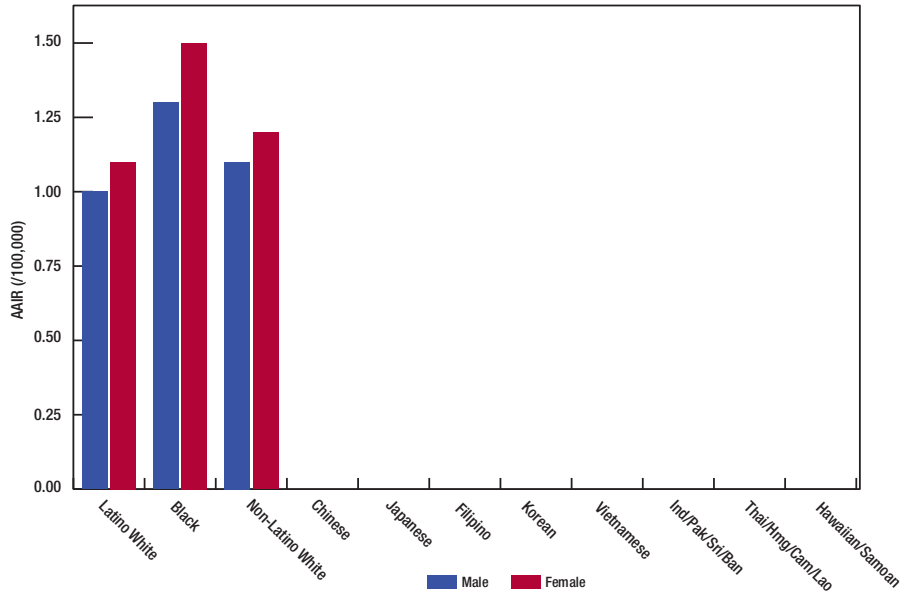


FIGURE 5. AGE-ADJUSTED INCIDENCE RATE BY SES BY RACE/ETHNICITY FOR AYA OTHER SOFT TISSUE SARCOMA (EXCL KAPOSI'S SARCOMA) IN LOS ANGELES COUNTY, 1988-2011

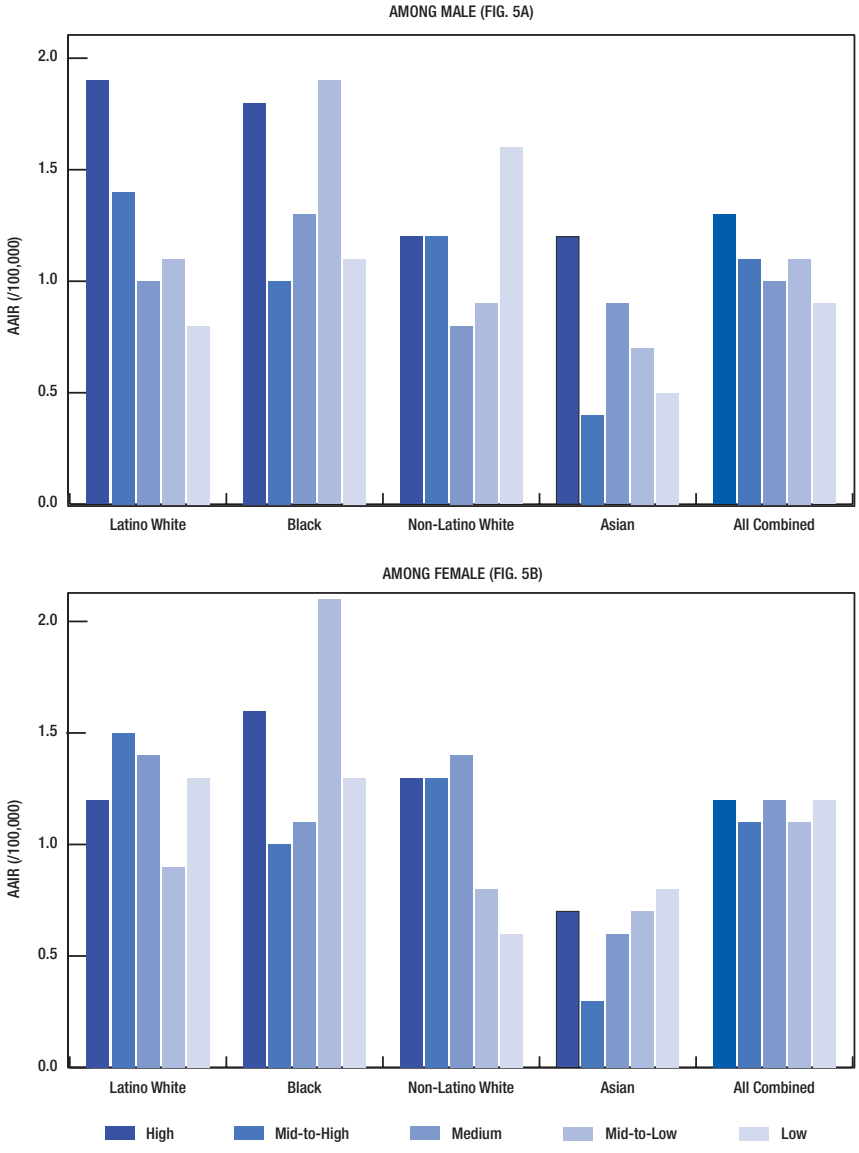
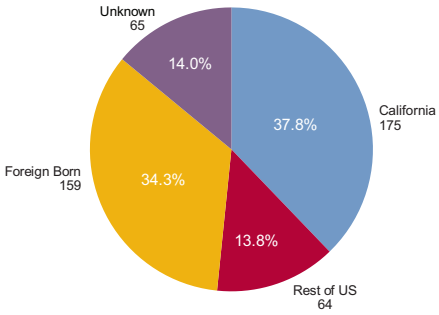
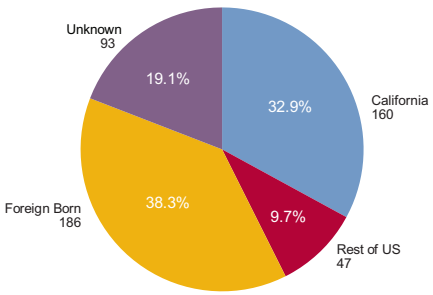


FIGURE 6. FREQUENCY DISTRIBUTION OF BIRTH PLACE FOR AYA OTHER SOFT TISSUE SARCOMA (EXCL KAPOSI'S SARCOMA) BY SEX IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 6A)

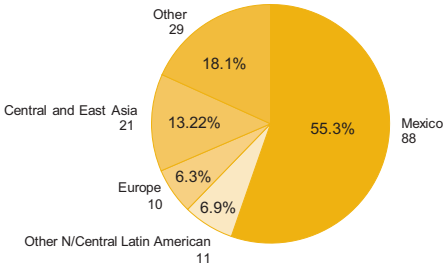


FEMALE (FIG. 6B)



AMONG FOREIGN BORN

MALE (FIG. 6C)



FEMALE (FIG. 6D)

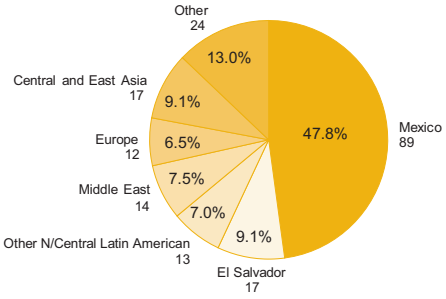
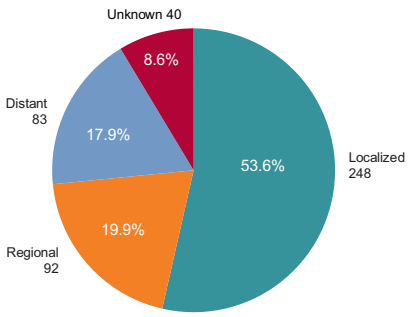
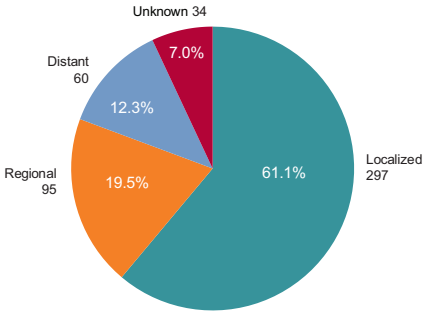


FIGURE 7. FREQUENCY DISTRIBUTION OF STAGE OF DISEASE BY SEX FOR AYA OTHER SOFT TISSUE SARCOMA (EXCL KAPOSI'S SARCOMA) IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 7A)



FEMALE (FIG. 7B)



BRAIN AND CENTRAL NERVOUS SYSTEM

Roberta McKean-Cowdin, PhD

Central nervous system (CNS) tumors are among the more frequent tumors in children under 15 years of age, but are less common in adults compared to cancer sites elsewhere in the body. In AYA, the diagnoses of new cases of CNS cancer are similar to rates in children and lower than rates in older adults. In AYA men and women combined, there were approximately 3 CNS tumors diagnosed per 100,000 people from 1988 to 2011.

The most common types of CNS tumor in AYAs are gliomas. Gliomas have several subtypes including low-grade astrocytomas, and higher grade anaplastic astrocytomas and glioblastomas. Cancers with higher grades (more abnormal-looking cells or patterns) tend to grow and spread more quickly and are difficult to treat. Less common types of glioma are grouped into 'other glioma' and 'astrocytoma not otherwise specified (NOS).' Another CNS tumor is meningioma.

The causes of most CNS tumors are unknown. Ionizing radiation, such as radiation therapy, is the only well-established environmental risk factor, but only a small amount of CNS tumors are likely to be explained by this exposure. Certain inherited syndromes are linked to CNS tumors, however these conditions are rare. Other factors that have been investigated as possible causes include non-ionizing radiation (for example from use of cell phones or exposure to power line transmissions), pesticides, occupational exposures, infection, prior head trauma, and diet. The results from these studies are inconsistent.

Exposures to parents before the birth of a child may also be important risk factors for CNS tumors in children and adolescents. For example, smoking by the father before and during pregnancy and exposure of the mother to residential pesticides has been associated with higher risk of CNS cancers in children up to 19 years of age in some studies.

RATES BY AGE AND SEX AND TIME TRENDS

The incidence rates of CNS tumors increase with age for all types of CNS tumors for both sexes. One exception is a relatively constant rate of low-grade astrocytomas from 15-39 years for males and females.

In Los Angeles County, approximately 124 CNS tumors in AYAs are diagnosed per year. The frequencies of higher-grade tumors (e.g., anaplastic astrocytomas and glioblastomas) are slightly greater in males than females, but the frequency by gender is similar for most other subtypes of CNS tumors with the exception of higher rates of meningioma (other specified intracranial and intraspinal neoplasms) for females.

From 1988-2011, rates of gliomas have remained relatively stable in AYAs (Figures 2, pg. 45, 49), while the frequency of unspecified astrocytoma has gone down (Figure 2, pg.57). The decrease in rates of unspecified astrocytoma suggests that the classification of CNS tumors has improved in recent years. In contrast, the age-adjusted incidence rate of other types of CNS tumors rose dramatically from 2002-2006 in Los Angeles County (Figure 2 , pg. 61) when benign brain tumors began to be counted.

RATES BY RACE/ETHNICITY, SOCIOECONOMIC STATUS AND BIRTHPLACE

In Los Angeles County, age-adjusted incidence rates of CNS tumors for non-Latino white AYAs are consistently higher than other racial/ethnic groups for each type of CNS tumor. Rates are highest in non-Latino white, followed by Latinos, and then black males and females for all types of CNS tumors except for unspecified astrocytoma for males, and other specified CNS tumors for females. For most types of CNS tumors (e.g., low-grade astrocytoma, anaplastic astrocytoma, glioblastoma, other glioma) the incidence rate is greater in people of higher SES. This pattern is generally consistent for males and females whether they are black, Latino, or non-Latino white. In contrast, the incidence rate of CNS tumors in Asian women tends to be higher in women of lower SES. Higher rates of CNS tumors with less detailed diagnoses (e.g., astrocytoma NOS) also tend to occur in males and females of lower SES and education, especially among non-Latino whites.

Approximately 32 to 33% of male and female AYAs diagnosed with a CNS tumor in Los Angeles County from 1988-2011 were born in California. A slightly higher percentage (34 to 36%) were born in California among people diagnosed with astrocytoma NOS. Depending on the subtype of CNS tumor, the percent of males (29-37%) and females (30-34%) who are foreign born varied slightly. After the United States, the most common country or regions of origin for individuals diagnosed with a CNS tumor are Mexico, Central and East Asia, other North and Central Latin countries, and the Middle East.

RATES BY STAGE AT DIAGNOSIS

The majority of CNS tumors remain localized within the skull, however some CNS tumors may spread to the surrounding brain tissue. In females, approximately 82% of low-grade astrocytomas are localized, while 73% are localized for higher-grade anaplastic astrocytomas or glioblastomas. In males, 87% of low-grade astrocytomas are localized while 73% are localized for anaplastic astrocytomas or glioblastomas. For other specified CNS tumors, which include the benign meningioma, 96-97% are localized among men and women.

TABLE 1.
AGE-ADJUSTED INCIDENCE RATE BY AGE FOR AYA ALL BRAIN AND CNS TUMORS IN LOS ANGELES COUNTY, 1988-2011

	Males		Females	
Age Group	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
15-24	399	2.2 (2.0–2.5)	329	2.0 (1.7–2.2)
25-34	703	3.6 (3.3–3.9)	601	3.2 (3.0–3.5)
35-39	466	5.2 (4.7–5.6)	479	5.4 (4.9–5.9)
All Ages 15-39	**1,568**	**3.4 (3.3–3.6)**	**1,409**	**3.2 (3.1–3.4)**

TABLE 2. AGE-ADJUSTED INCIDENCE RATE BY AGE AND RACE/ETHNICITY FOR AYA ALL BRAIN AND CNS TUMORS IN LOS ANGELES COUNTY, 1988-2011

MALES								
	All Ages 15-24		**All Ages 25-34**		**All Ages 35-39**		**All Ages 15-39**	
Race/Ethnicity	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
Latino White	173	1.8 (1.6-2.1)	263	2.9 (2.6-3.3)	167	4.5 (3.8-5.2)	603	2.9 (2.6-3.1)
Black	36	2.1 (1.4-2.8)	46	2.7 (2.0-3.5)	30	3.7 (2.3-5.0)	112	2.7 (2.2-3.2)
Non-Latino White	146	3.4 (2.8-3.9)	309	5.0 (4.4-5.6)	221	6.9 (6.0-7.8)	676	4.8 (4.4-5.2)
Chinese	<20	—	<20	—	<20	—	36	2.3 (1.6-3.1)
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	32	2.7 (1.7-3.6)
Korean	<20	—	<20	—	<20	—	24	2.7 (1.6-3.8)
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—
FEMALES								
Latino White	132	1.6 (1.3-1.8)	241	3.0 (2.6-3.3)	181	5.1 (4.3-5.8)	554	2.9 (2.7-3.1)
Black	38	2.2 (1.5-2.8)	44	2.3 (1.6-3.0)	37	3.9 (2.6-5.1)	119	2.6 (2.1-3.1)
Non-Latino White	109	2.5 (2.0-3.0)	248	4.3 (3.8-4.9)	197	6.7 (5.8-7.6)	554	4.2 (3.8-4.5)
Chinese	<20	—	<20	—	<20	—	34	2.0 (1.3-2.7)
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	33	2.4 (1.6-3.2)
Korean	<20	—	<20	—	<20	—	21	2.3 (1.3-3.3)
Vietnamese	<20	—	<20	—	<20	—	24	5.8 (3.5-8.1)
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—

FIGURE 1. AGE-SPECIFIC RATE BY SEX FOR AYA ALL BRAIN AND CNS TUMORS IN LOS ANGELES COUNTY, 1988-2011

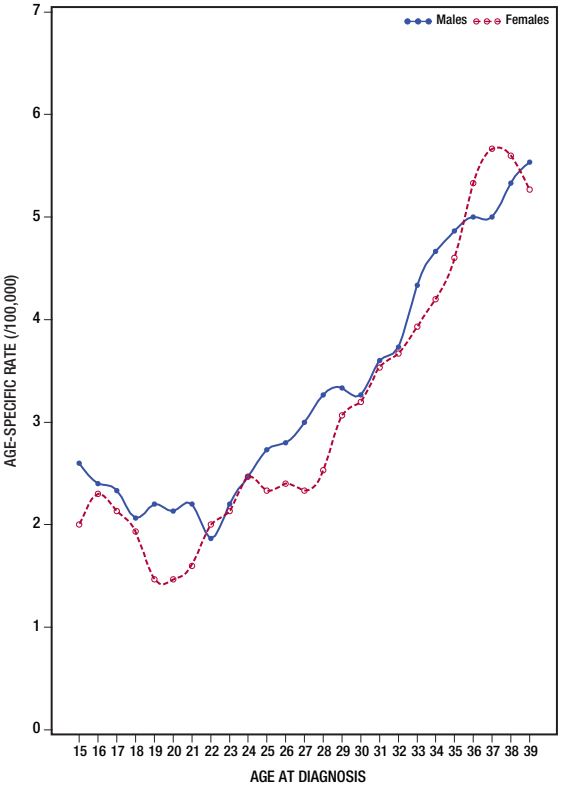


FIGURE 2. TREND IN AGE-ADJUSTED INCIDENCE RATE BY SEX FOR AYA ALL BRAIN AND CNS TUMORS IN LOS ANGELES COUNTY, 1988-2011

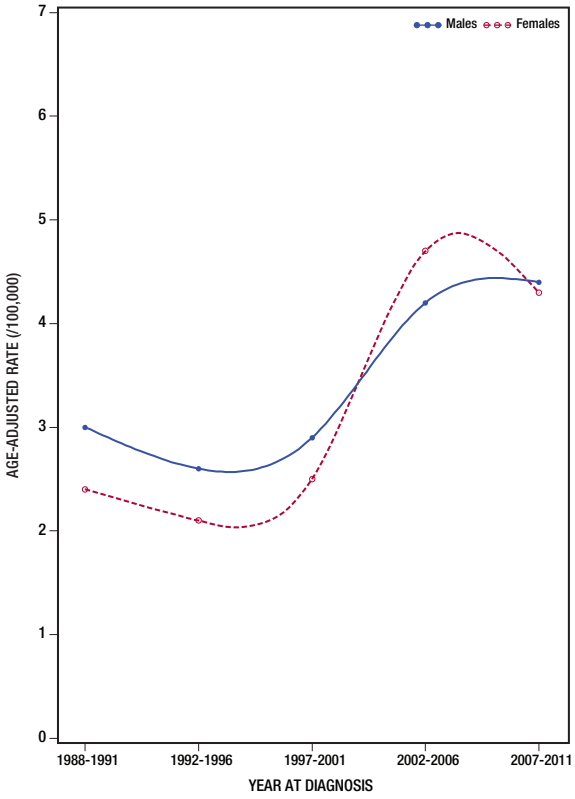


FIGURE 3. TREND IN AGE-SPECIFIC RATE BY SEX FOR AYA ALL BRAIN AND CNS TUMORS IN LOS ANGELES COUNTY, 1988-2011

FIG 3(A): MALES

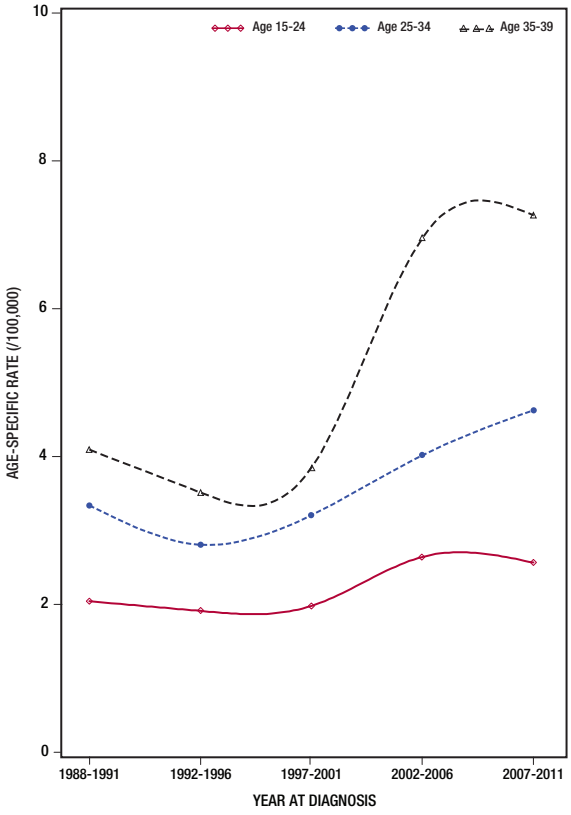


FIG 3(B): FEMALES

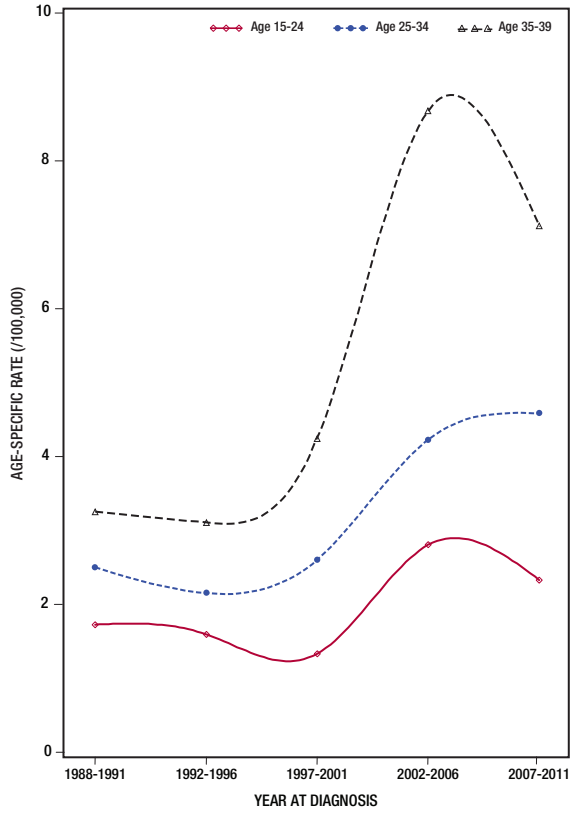


FIGURE 4. AGE-ADJUSTED INCIDENCE RATE BY RACE/ETHNICITY FOR AYA ALL BRAIN AND CNS TUMORS IN LOS ANGELES COUNTY, 1988-2011

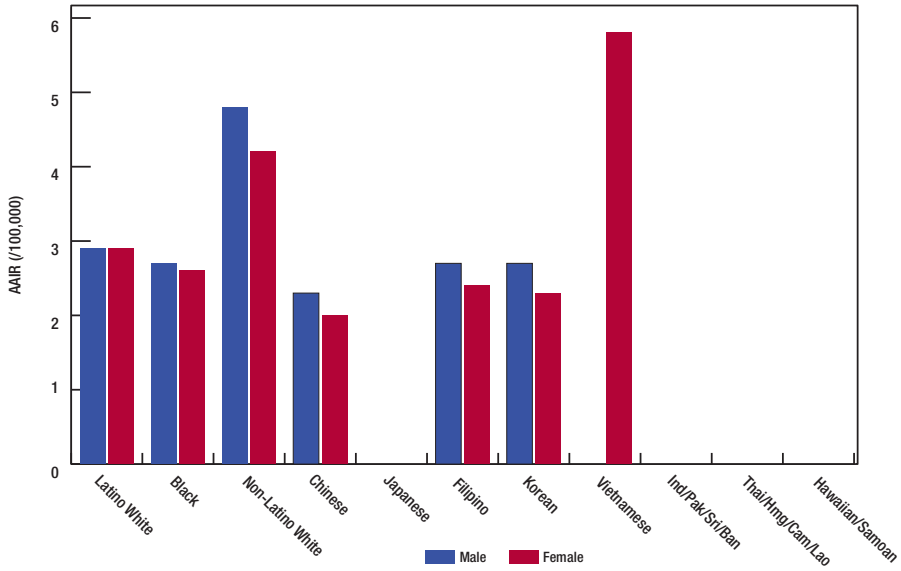


FIGURE 5. AGE-ADJUSTED INCIDENCE RATE BY SES BY RACE/ETHNICITY FOR AYA ALL BRAIN AND CNS TUMORS IN LOS ANGELES COUNTY, 1988-2011

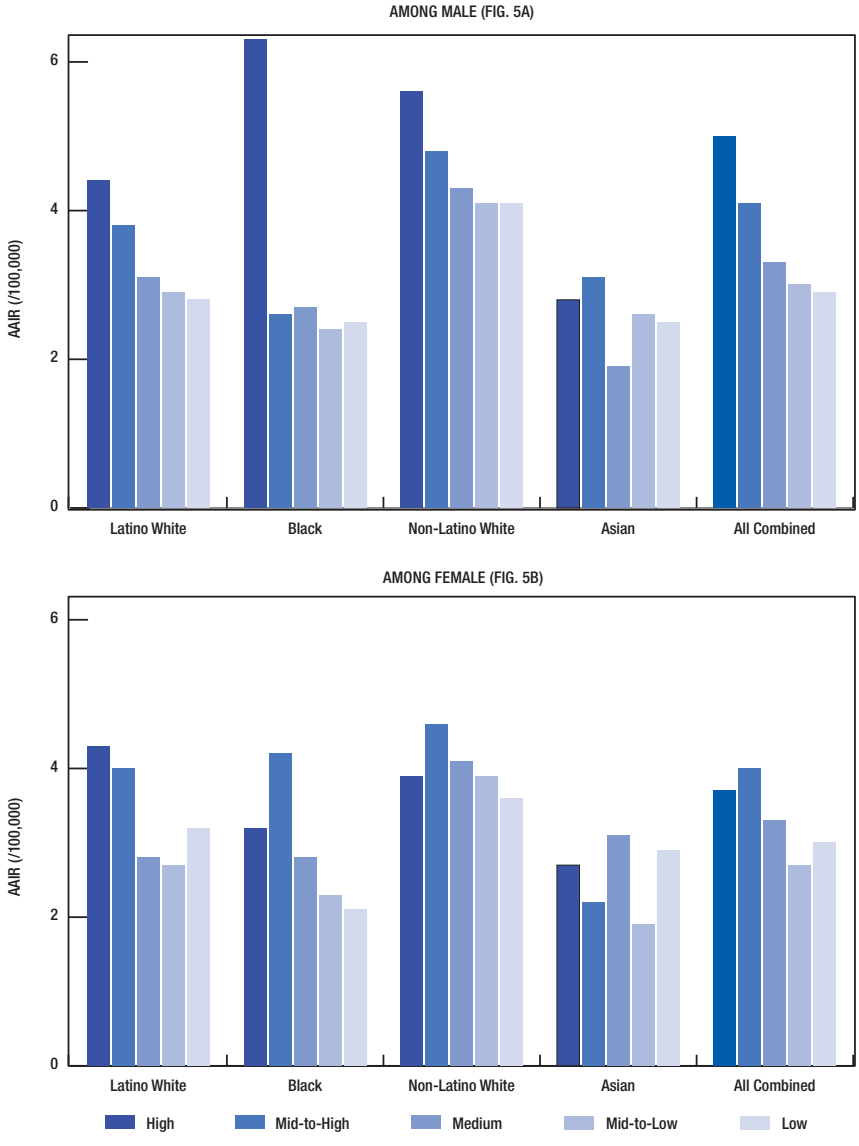
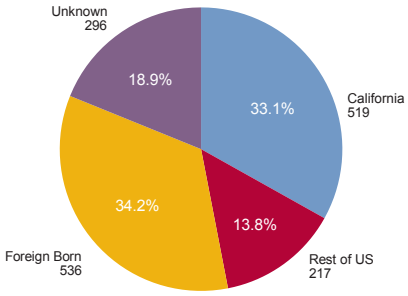
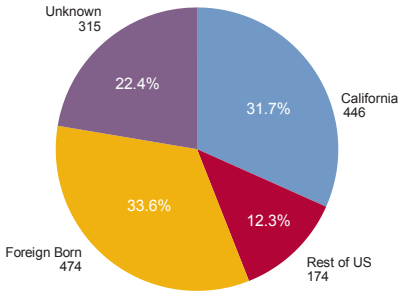


FIGURE 6. FREQUENCY DISTRIBUTION OF BIRTH PLACE FOR AYA ALL BRAIN AND CNS TUMORS BY SEX IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 6A)

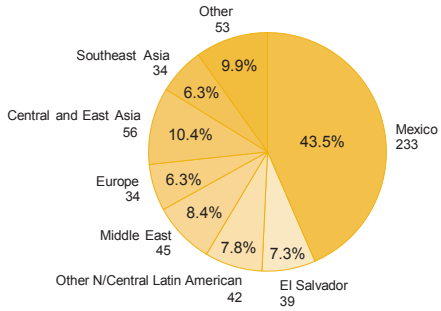


FEMALE (FIG. 6B)



AMONG FOREIGN BORN

MALE (FIG. 6C)



FEMALE (FIG. 6D)

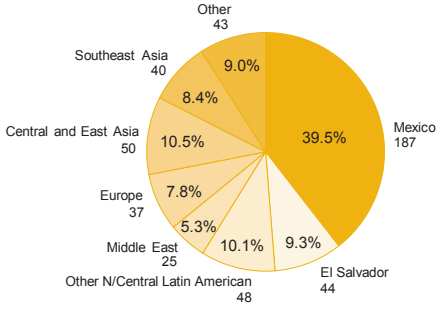
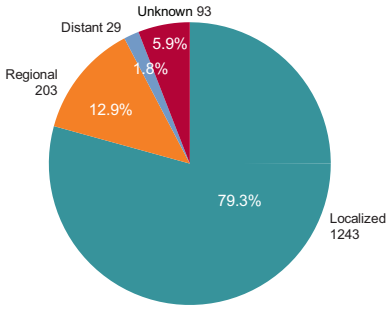


FIGURE 7. FREQUENCY DISTRIBUTION OF STAGE OF DISEASE BY SEX FOR AYA ALL BRAIN AND CNS TUMORS IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 7A)



FEMALE (FIG. 7B)

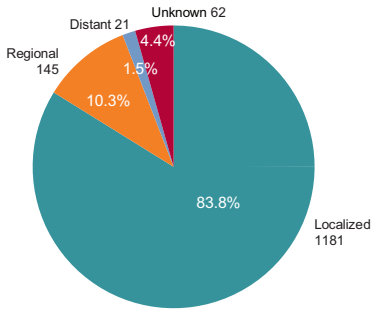


TABLE 1.
AGE-ADJUSTED INCIDENCE RATE BY AGE FOR AYA SPECIFIED LOW-GRADE ASTROCYTOMA IN LOS ANGELES COUNTY, 1988-2011

	Males		Females	
Age Group	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
15-24	68	0.4 (0.3–0.5)	61	0.4 (0.3–0.5)
25-34	67	0.3 (0.3–0.4)	49	0.3 (0.2–0.3)
35-39	30	0.3 (0.2–0.5)	29	0.3 (0.2–0.4)
All Ages 15-39	**165**	**0.4 (0.3–0.4)**	**139**	**0.3 (0.3–0.4)**

TABLE 2. AGE-ADJUSTED INCIDENCE RATE BY AGE AND RACE/ETHNICITY FOR AYA SPECIFIED LOW-GRADE ASTROCYTOMA IN LOS ANGELES COUNTY, 1988-2011

MALES								
	All Ages 15-24		**All Ages 25-34**		**All Ages 35-39**		**All Ages 15-39**	
Race/Ethnicity	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
Latino White	28	0.3 (0.2-0.4)	<20	—	<20	—	56	0.3 (0.2-0.3)
Black	<20	—	<20	—	<20	—	<20	—
Non-Latino White	29	0.7 (0.4-0.9)	33	0.5 (0.4-.07)	<20	—	78	0.6 (0.5-0.7)
Chinese	<20	—	<20	—	<20	—	<20	—
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	<20	—
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—
FEMALES								
Latino White	24	0.3 (0.2-0.4)	20	0.2 (0.1-0.4)	<20	—	54	0.3 (0.2-0.3)
Black	<20	—	<20	—	<20	—	<20	—
Non-Latino White	20	0.5 (0.3-0.7)	24	0.4 (0.3-0.6)	<20	—	55	0.4 (0.3-0.5)
Chinese	<20	—	<20	—	<20	—	<20	—
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	<20	—
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—

FIGURE 1. AGE-SPECIFIC RATE BY SEX FOR AYA SPECIFIED LOW-GRADE ASTROCYTOMA IN LOS ANGELES COUNTY, 1988-2011

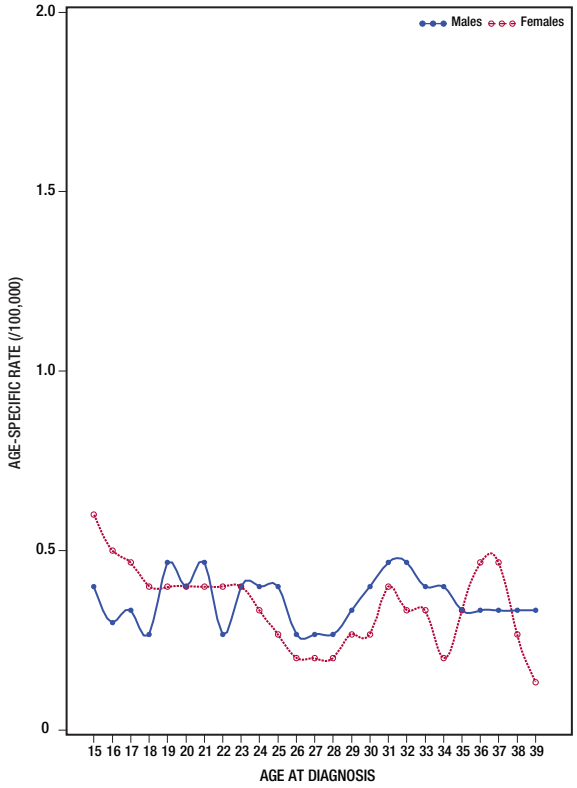


FIGURE 2. TREND IN AGE-ADJUSTED INCIDENCE RATE BY SEX FOR AYA SPECIFIED LOW-GRADE ASTROCYTOMA IN LOS ANGELES COUNTY, 1988-2011

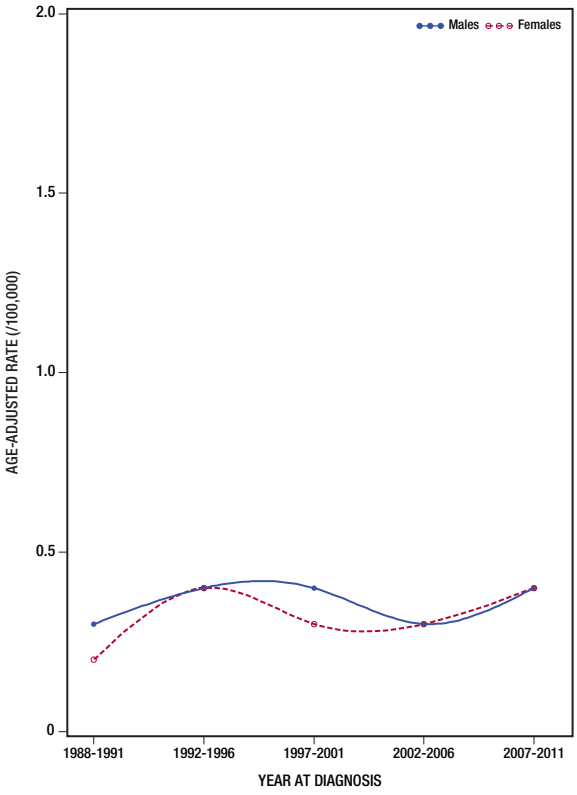


FIGURE 3. TREND IN AGE-SPECIFIC RATE BY SEX FOR AYA SPECIFIED LOW-GRADE ASTROCYTOMA IN LOS ANGELES COUNTY, 1988-2011

FIG 3(A): MALES

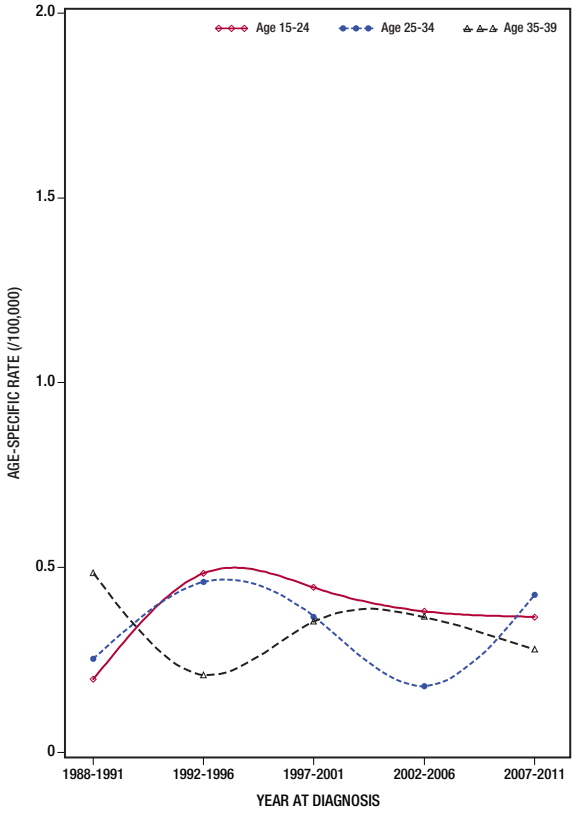


FIG 3(B): FEMALES

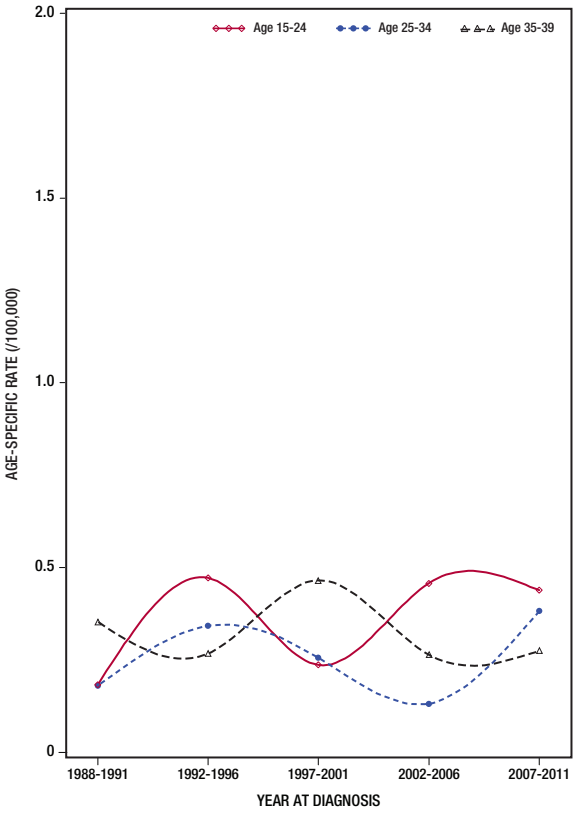


FIGURE 4. AGE-ADJUSTED INCIDENCE RATE BY RACE/ETHNICITY FOR AYA SPECIFIED LOW-GRADE ASTROCYTOMA IN LOS ANGELES COUNTY, 1988-2011

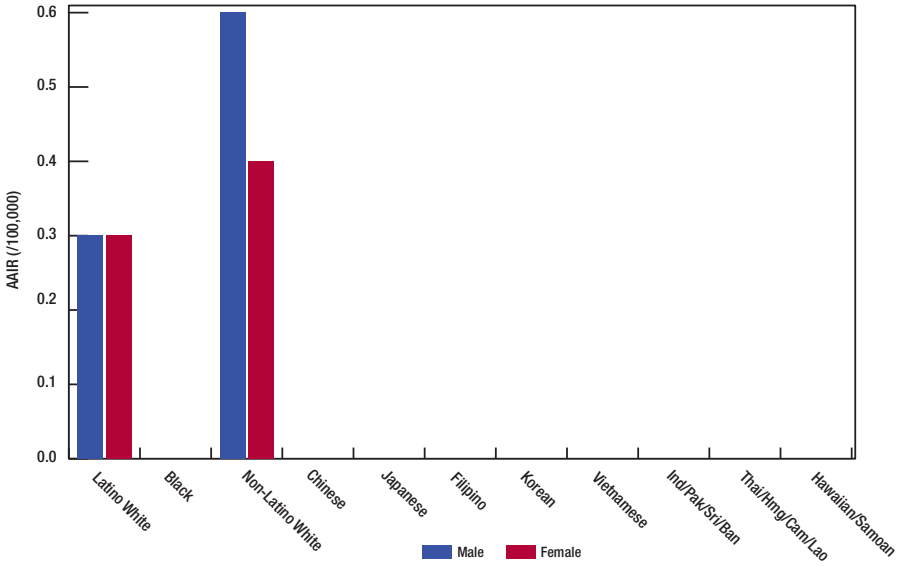


FIGURE 5. AGE-ADJUSTED INCIDENCE RATE BY SES BY RACE/ETHNICITY FOR AYA SPECIFIED LOW-GRADE ASTROCYTOMA IN LOS ANGELES COUNTY, 1988-2011

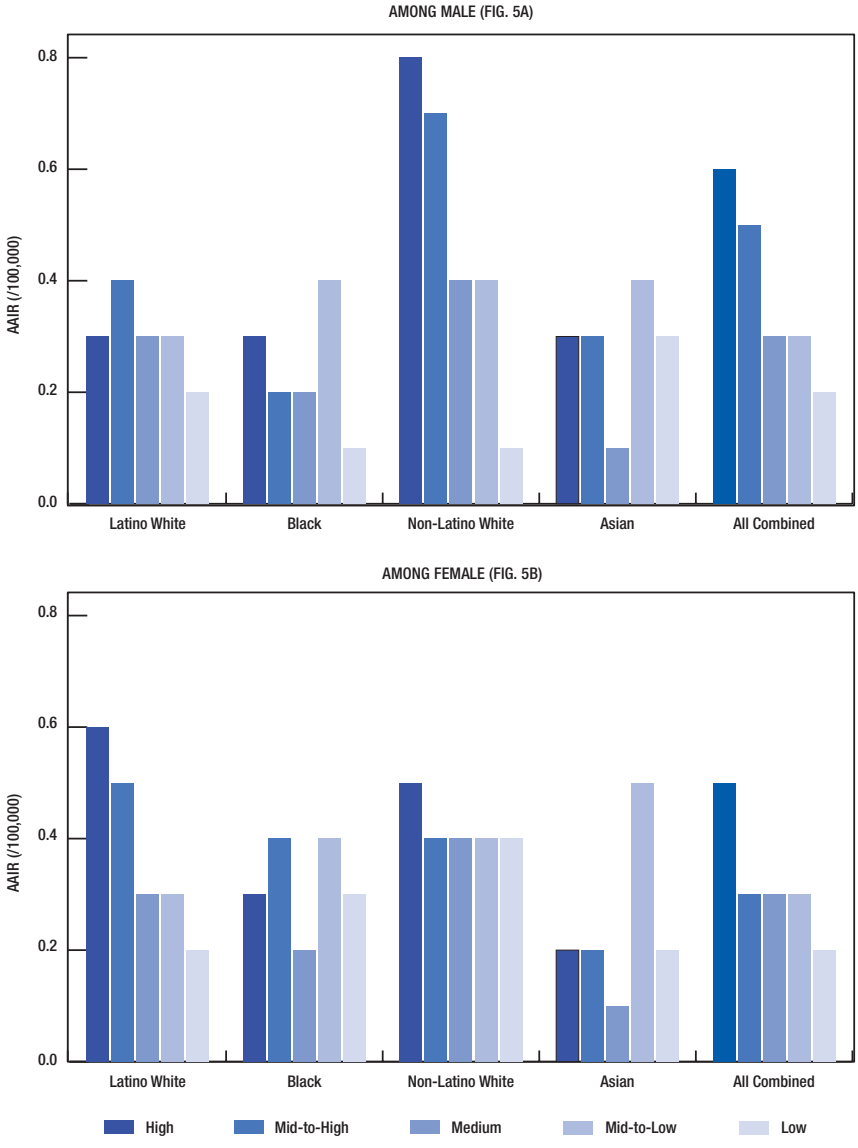
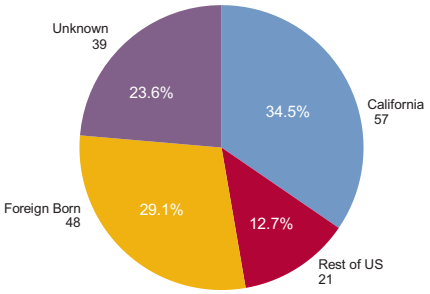
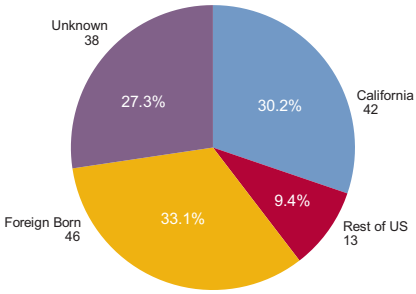


FIGURE 6. FREQUENCY DISTRIBUTION OF BIRTH PLACE FOR AYA SPECIFIED LOW-GRADE ASTROCYTOMA BY SEX IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 6A)

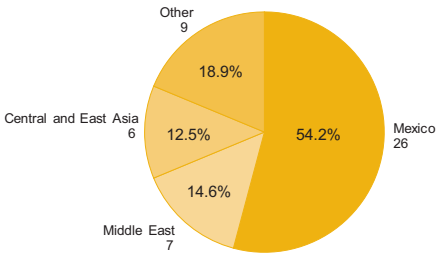


FEMALE (FIG. 6B)



AMONG FOREIGN BORN

MALE (FIG. 6C)



FEMALE (FIG. 6D)

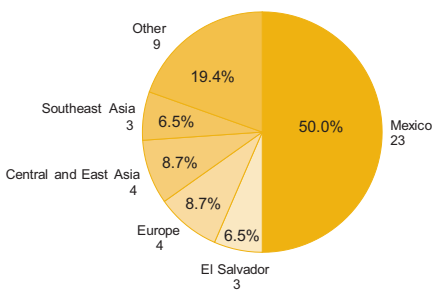
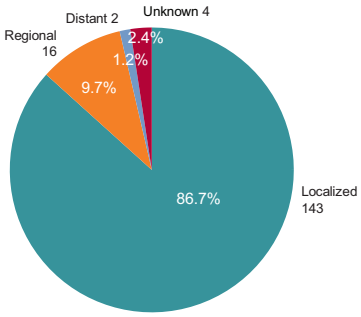


FIGURE 7. FREQUENCY DISTRIBUTION OF STAGE OF DISEASE BY SEX FOR AYA SPECIFIED LOW-GRADE ASTROCYTOMA IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 7A)



FEMALE (FIG. 7B)

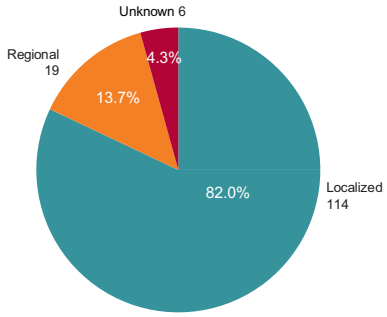


TABLE 1.
AGE-ADJUSTED INCIDENCE RATE BY AGE FOR AYA GLIOBLASTOMA AND ANAPLASTIC ASTROCYTOMA IN LOS ANGELES COUNTY, 1988-2011

	Males		Females	
Age Group	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
15-24	64	0.4 (0.3–0.4)	41	0.2 (0.2–0.3)
25-34	169	0.9 (0.7–1.0)	105	0.6 (0.5–0.7)
35-39	127	1.4 (1.2–1.6)	78	0.9 (0.7–1.1)
All Ages 15-39	**360**	**0.8 (0.7–0.9)**	**224**	**0.5 (0.4–0.6)**

TABLE 2. AGE-ADJUSTED INCIDENCE RATE BY AGE AND RACE/ETHNICITY FOR AYA GLIOBLASTOMA AND ANAPLASTIC ASTROCYTOMA IN LOS ANGELES COUNTY, 1988-2011

MALES								
	All Ages 15-24		**All Ages 25-34**		**All Ages 35-39**		**All Ages 15-39**	
Race/Ethnicity	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
Latino White	25	0.3 (0.2-0.4)	61	0.7 (0.5-0.9)	47	1.3 (0.9-1.6)	133	0.7 (0.5-0.8)
Black	<20	—	<20	—	<20	—	24	0.6 (0.3-0.8)
Non-Latino White	21	0.5 (0.3-0.7)	79	1.3 (1.0-1.6)	65	2.0 (1.5-2.5)	165	1.1 (1.0-1.3)
Chinese	<20	—	<20	—	<20	—	<20	—
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	<20	—
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—
FEMALES								
Latino White	<20	—	43	0.5 (0.4-0.7)	26	0.7 (0.4-1.0)	83	0.4 (0.3-0.5)
Black	<20	—	<20	—	<20	—	<20	—
Non-Latino White	<20	—	47	0.8 (0.6-1.1)	33	1.1 (0.7-1.5)	93	0.7 (0.5-0.8)
Chinese	<20	—	<20	—	<20	—	<20	—
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	<20	—
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—

FIGURE 1. AGE-SPECIFIC RATE BY SEX FOR AYA GLIOBLASTOMA AND ANAPLASTIC ASTROCYTOMA IN LOS ANGELES COUNTY, 1988-2011

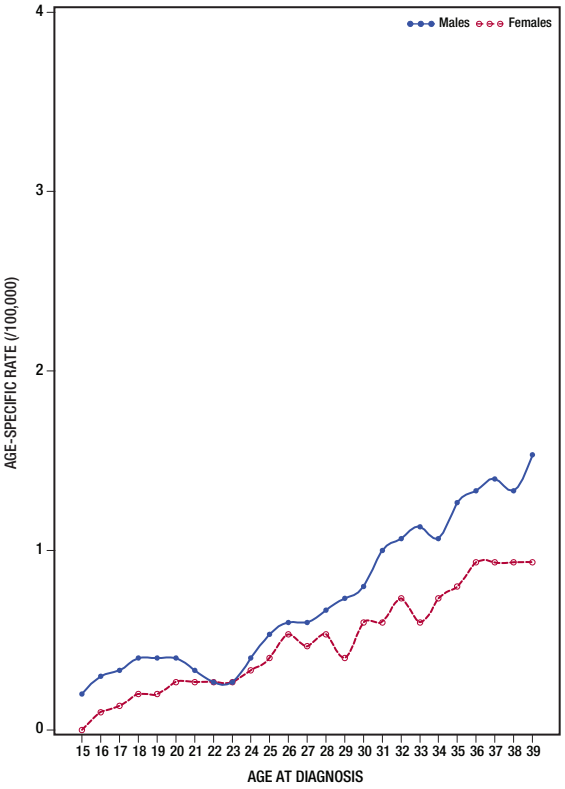


FIGURE 2. TREND IN AGE-ADJUSTED INCIDENCE RATE BY SEX FOR AYA GLIOBLASTOMA AND ANAPLASTIC ASTROCYTOMA IN LOS ANGELES COUNTY, 1988-2011

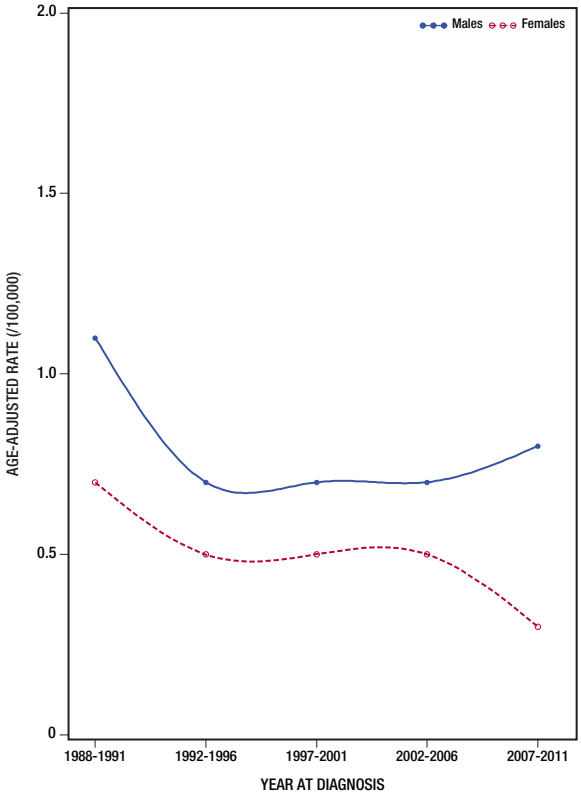


FIGURE 3. TREND IN AGE-SPECIFIC RATE BY SEX FOR AYA GLIOBLASTOMA AND ANAPLASTIC ASTROCYTOMA IN LOS ANGELES COUNTY, 1988-2011

FIG 3(A): MALES

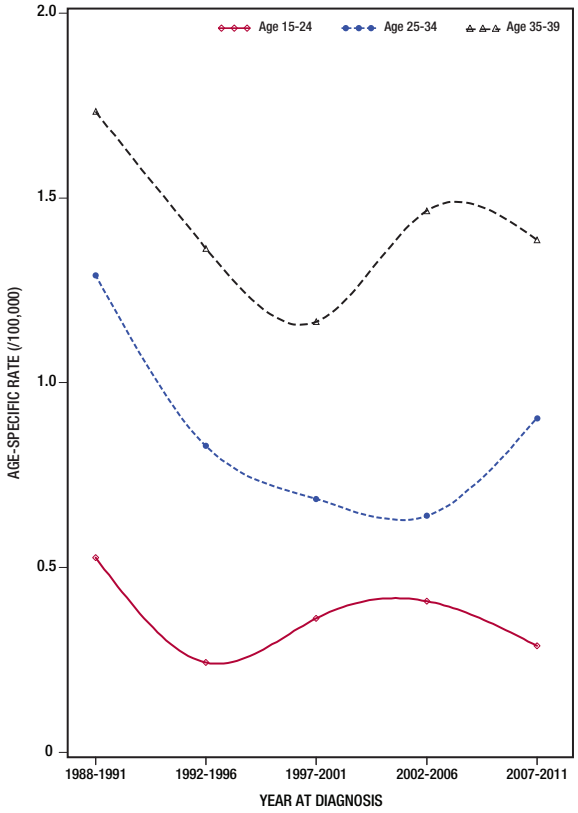


FIG 3(B): FEMALES

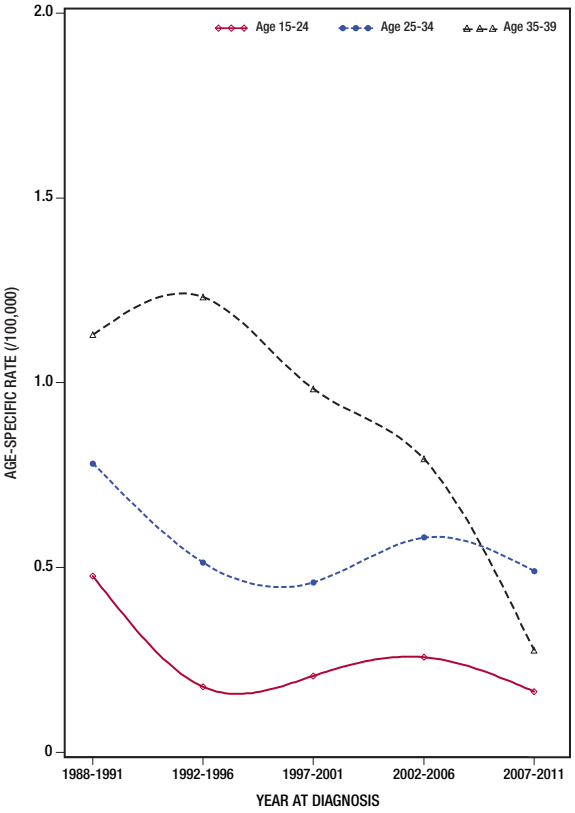


FIGURE 4. AGE-ADJUSTED INCIDENCE RATE BY RACE/ETHNICITY FOR AYA GLIOBLASTOMA AND ANAPLASTIC ASTROCYTOMA IN LOS ANGELES COUNTY, 1988-2011

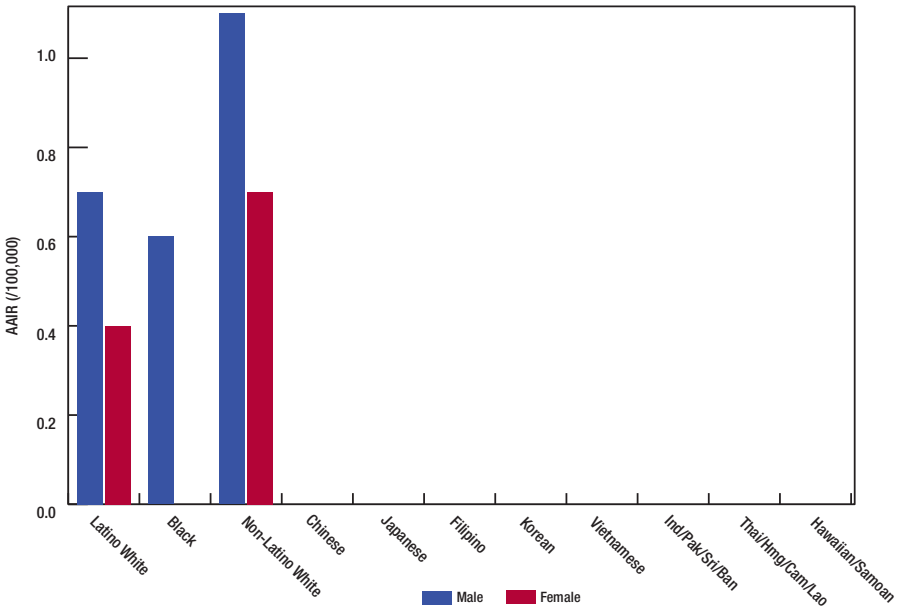


FIGURE 5. AGE-ADJUSTED INCIDENCE RATE BY SES BY RACE/ETHNICITY FOR AYA GLIOBLASTOMA AND ANAPLASTIC ASTROCYTOMA IN LOS ANGELES COUNTY, 1988-2011

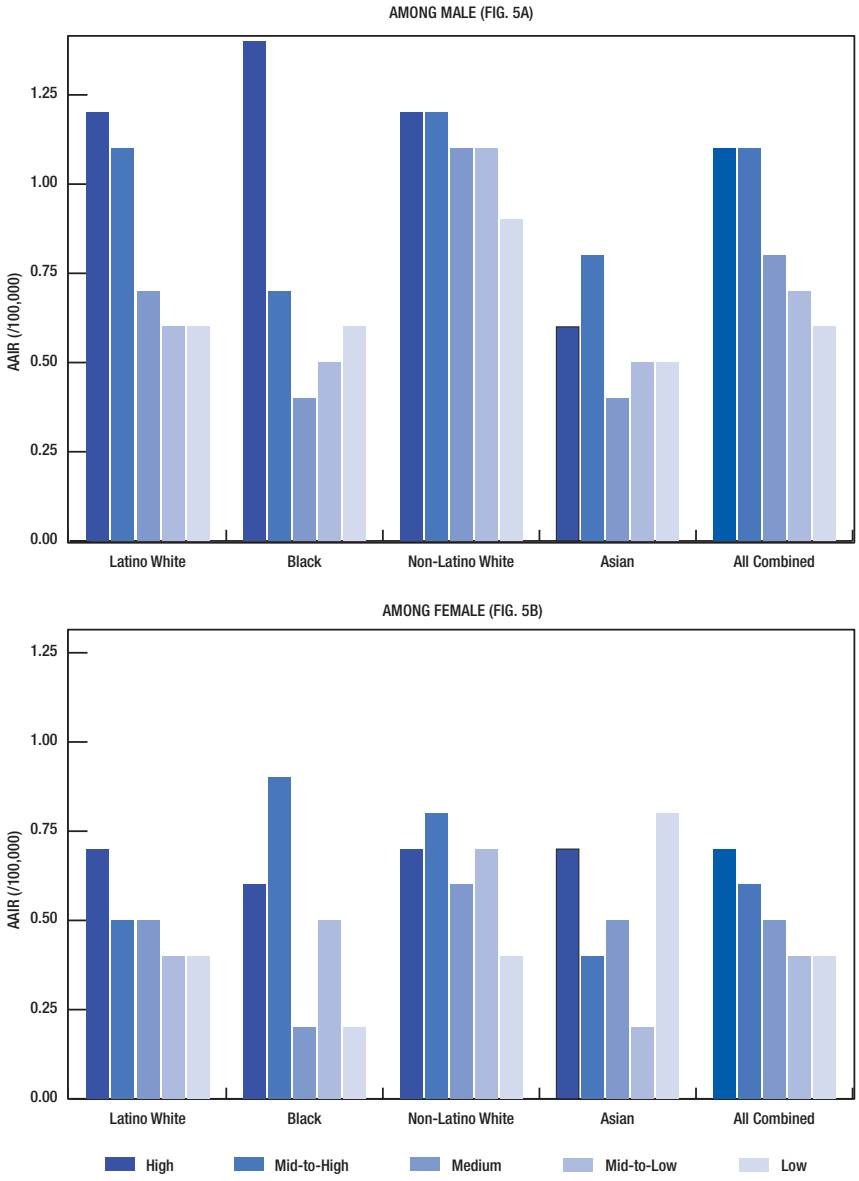
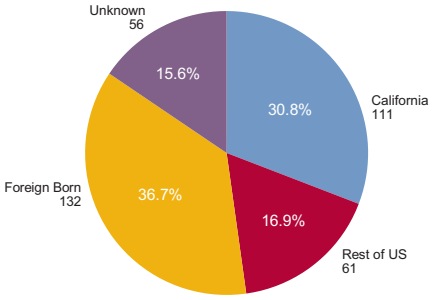
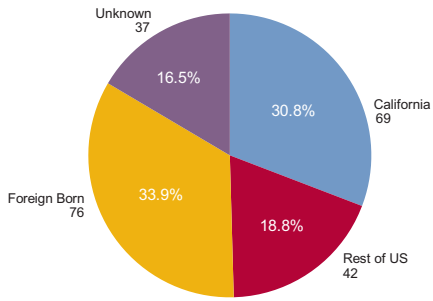


FIGURE 6. FREQUENCY DISTRIBUTION OF BIRTH PLACE FOR AYA GLIOBLASTOMA AND ANAPLASTIC ASTROCYTOMA BY SEX IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 6A)

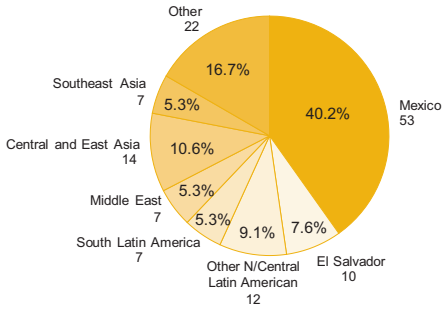


FEMALE (FIG. 6B)



AMONG FOREIGN BORN

MALE (FIG. 6C)



FEMALE (FIG. 6D)

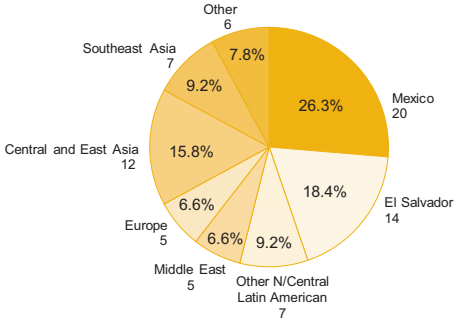
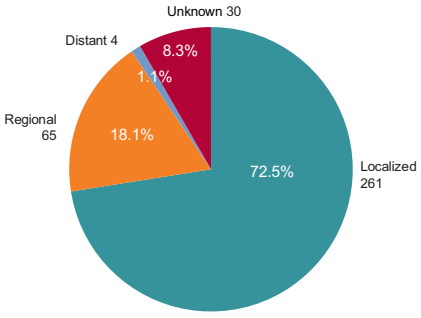


FIGURE 7. FREQUENCY DISTRIBUTION OF STAGE OF DISEASE BY SEX FOR AYA GLIOBLASTOMA AND ANAPLASTIC ASTROCYTOMA IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 7A)



FEMALE (FIG. 7B)

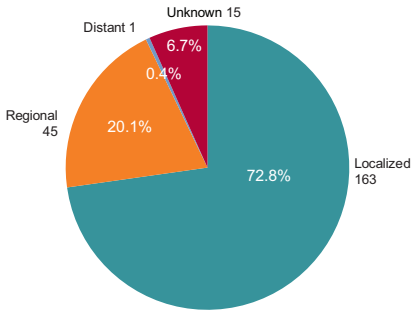


TABLE 1.
AGE-ADJUSTED INCIDENCE RATE BY AGE FOR AYA OTHER GLIOMA IN LOS ANGELES COUNTY, 1988-2011

	Males		Females	
Age Group	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
15-24	64	0.4 (0.3–0.4)	50	0.3 (0.2–0.4)
25-34	158	0.8 (0.7–0.9)	125	0.7 (0.6–0.8)
35-39	85	0.9 (0.7–1.1)	80	0.9 (0.7–1.1)
All Ages 15-39	**307**	**0.7 (0.6–0.7)**	**255**	**0.6 (0.5–0.6)**

TABLE 2. AGE-ADJUSTED INCIDENCE RATE BY AGE AND RACE/ETHNICITY FOR AYA OTHER GLIOMA IN LOS ANGELES COUNTY, 1988-2011

MALES								
	All Ages 15-24		**All Ages 25-34**		**All Ages 35-39**		**All Ages 15-39**	
Race/Ethnicity	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
Latino White	26	0.3 (0.2-0.4)	55	0.6 (0.5-0.8)	29	0.8 (0.5-1.1)	110	0.5 (0.4-0.6)
Black	<20	—	<20	—	<20	—	20	0.5 (0.3-0.7)
Non-Latino White	23	0.5 (0.3-0.8)	73	1.2 (0.9-1.4)	45	1.4 (1.0-1.8)	141	1.0 (0.8-1.1)
Chinese	<20	—	<20	—	<20	—	<20	—
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	<20	—
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—
FEMALES								
Latino White	<20	—	52	0.6 (0.5-0.8)	33	0.9 (0.6-1.2)	103	0.5 (0.4-0.6)
Black	<20	—	<20	—	<20	—	<20	—
Non-Latino White	<20	—	53	0.9 (0.7-1.2)	37	1.3 (0.9-1.7)	108	0.8 (0.6-1.0)
Chinese	<20	—	<20	—	<20	—	<20	—
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	<20	—
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—

FIGURE 1. AGE-SPECIFIC RATE BY SEX FOR AYA OTHER GLIOMA IN LOS ANGELES COUNTY, 1988-2011

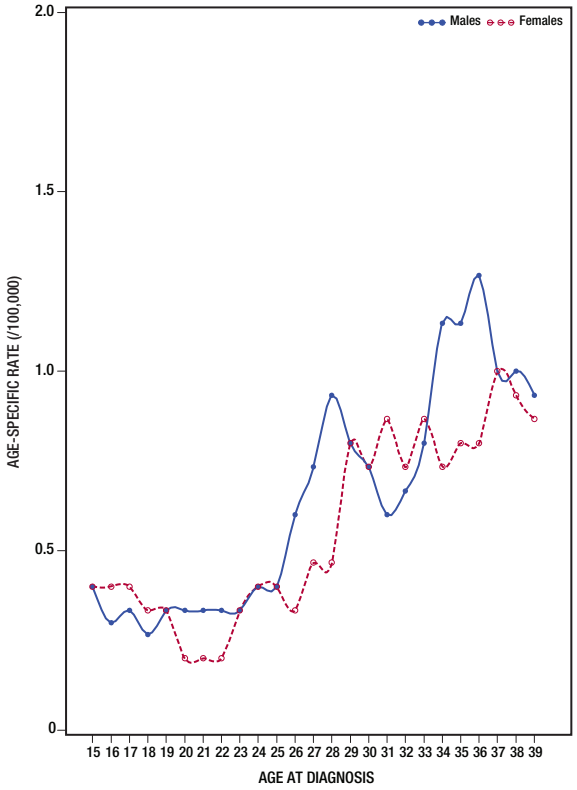


FIGURE 2. TREND IN AGE-ADJUSTED INCIDENCE RATE BY SEX FOR AYA OTHER GLIOMA IN LOS ANGELES COUNTY, 1988-2011

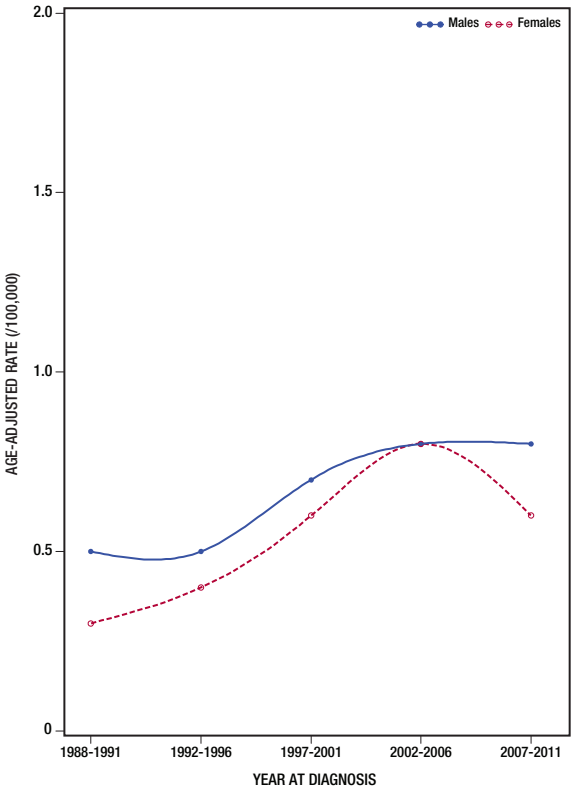


FIGURE 3. TREND IN AGE-SPECIFIC RATE BY SEX FOR AYA OTHER GLIOMA IN LOS ANGELES COUNTY, 1988-2011

FIG 3(A): MALES

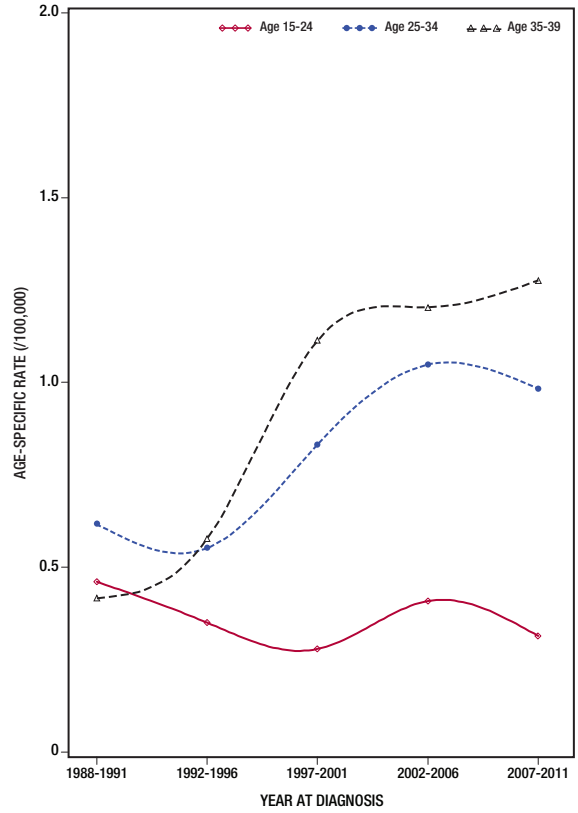


FIG 3(B): FEMALES

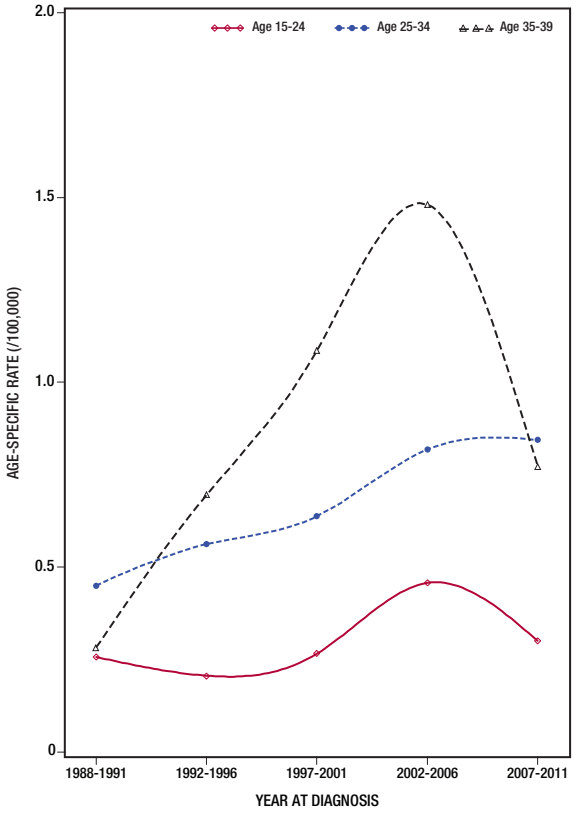


FIGURE 4. AGE-ADJUSTED INCIDENCE RATE BY RACE/ETHNICITY FOR AYA OTHER GLIOMA IN LOS ANGELES COUNTY, 1988-2011

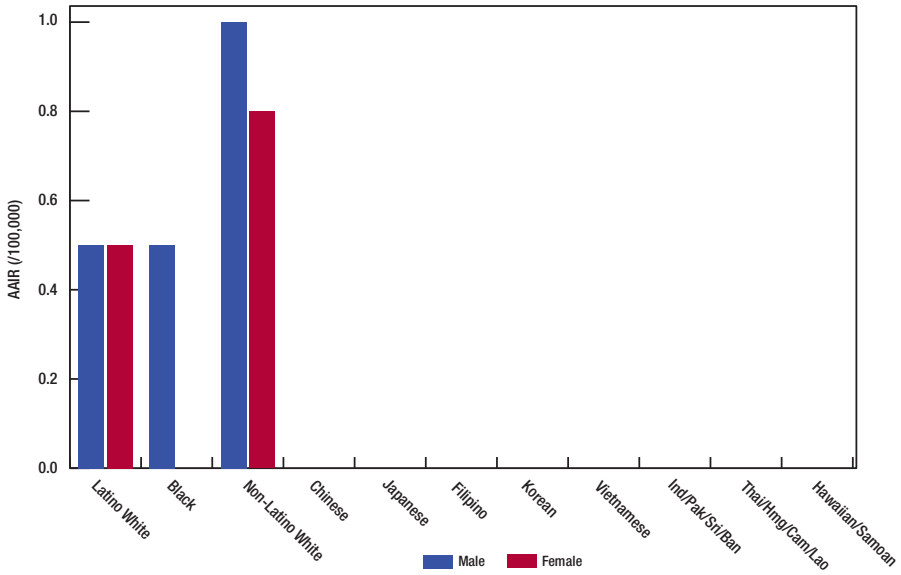


FIGURE 5. AGE-ADJUSTED INCIDENCE RATE BY SES BY RACE/ETHNICITY FOR AYA OTHER GLIOMA IN LOS ANGELES COUNTY, 1988-2011

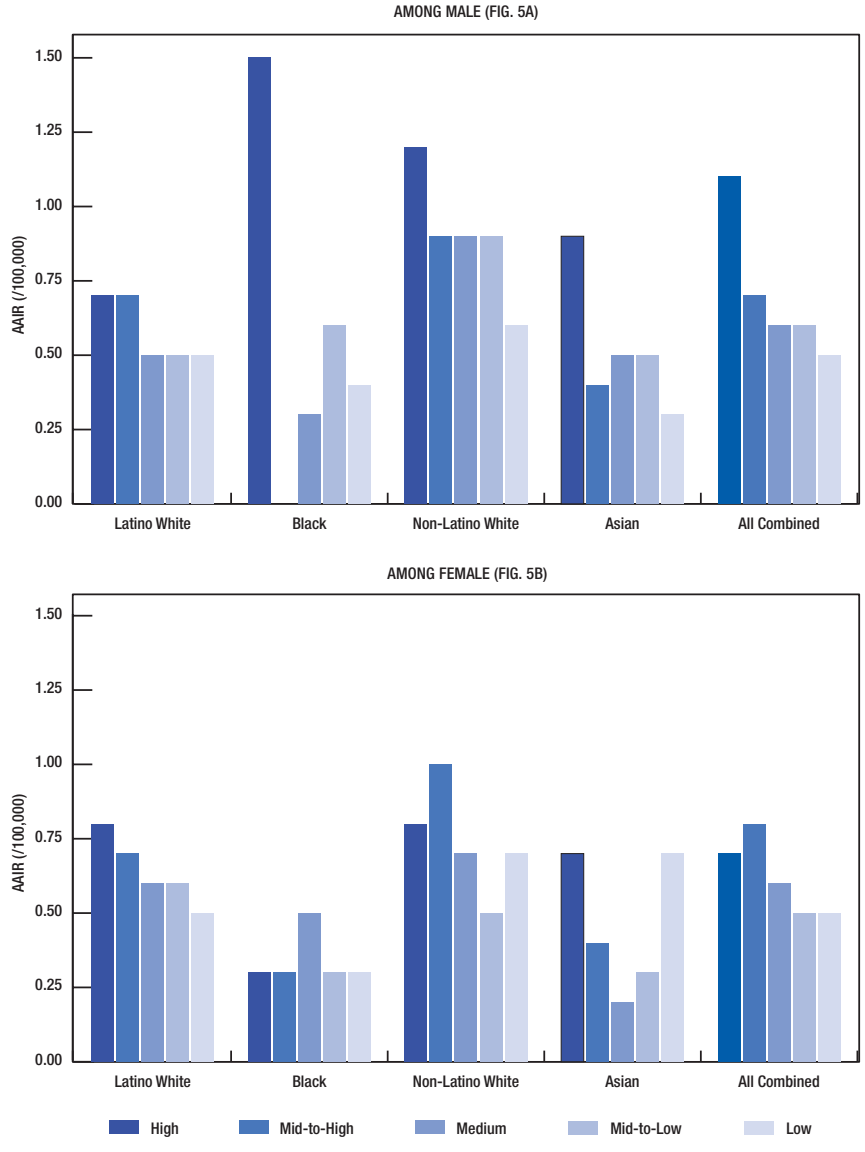
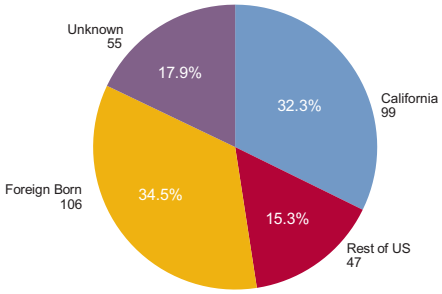
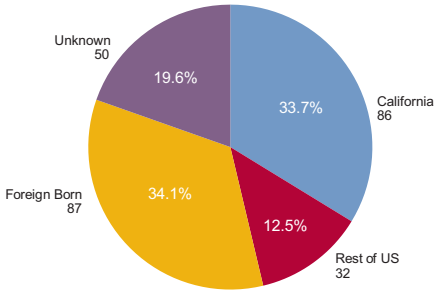


FIGURE 6. FREQUENCY DISTRIBUTION OF BIRTH PLACE FOR AYA OTHER GLIOMA BY SEX IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 6A)

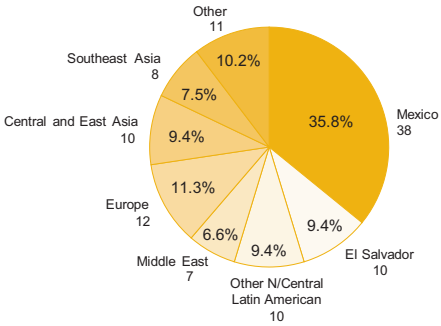


FEMALE (FIG. 6B)



AMONG FOREIGN BORN

MALE (FIG. 6C)



FEMALE (FIG. 6D)

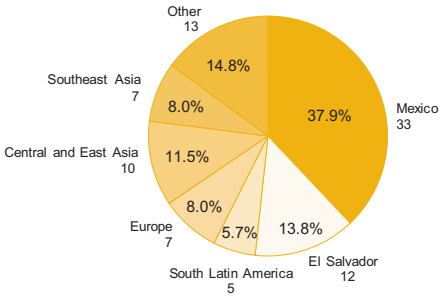
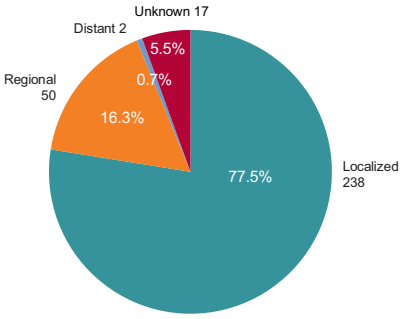


FIGURE 7. FREQUENCY DISTRIBUTION OF STAGE OF DISEASE BY SEX FOR AYA OTHER GLIOMA IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 7A)



FEMALE (FIG. 7B)

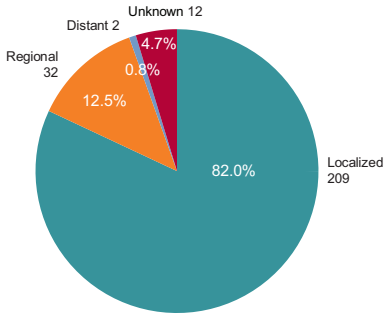


TABLE 1.
AGE-ADJUSTED INCIDENCE RATE BY AGE FOR AYA ASTROCYTOMA NOS IN LOS ANGELES COUNTY, 1988-2011

	Males		Females	
Age Group	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
15-24	49	0.3 (0.2–0.4)	40	0.2 (0.2–0.3)
25-34	87	0.4 (0.4–0.5)	63	0.3 (0.3–0.4)
35-39	56	0.6 (0.5–0.8)	45	0.5 (0.4–0.7)
All Ages 15-39	**192**	**0.4 (0.4–0.5)**	**148**	**0.3 (0.3–0.4)**

TABLE 2. AGE-ADJUSTED INCIDENCE RATE BY AGE AND RACE/ETHNICITY FOR AYA ASTROCYTOMA NOS IN LOS ANGELES COUNTY, 1988-2011

MALES								
	All Ages 15-24		**All Ages 25-34**		**All Ages 35-39**		**All Ages 15-39**	
Race/Ethnicity	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
Latino White	<20	—	26	0.3 (0.2-0.4)	<20	—	58	0.3 (0.2-0.3)
Black	<20	—	<20	—	<20	—	20	0.5 (0.3-0.7)
Non-Latino White	24	0.5 (0.3-0.8)	43	0.7 (0.5-0.9)	27	0.8 (0.5-1.2)	97	0.7 (0.5-0.8)
Chinese	<20	—	<20	—	<20	—	<20	—
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	<20	—
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—
FEMALES								
Latino White	<20	—	28	0.3 (0.2-0.5)	<20	—	51	0.3 (0.2-0.3)
Black	<20	—	<20	—	<20	—	<20	—
Non-Latino White	22	0.5 (0.3-0.7)	29	0.5 (0.3-0.7)	27	0.9 (0.6-1.3)	78	0.6 (0.5-0.7)
Chinese	<20	—	<20	—	<20	—	<20	—
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	<20	—
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—

FIGURE 1. AGE-SPECIFIC RATE BY SEX FOR AYA ASTROCYTOMA NOS IN LOS ANGELES COUNTY, 1988-2011

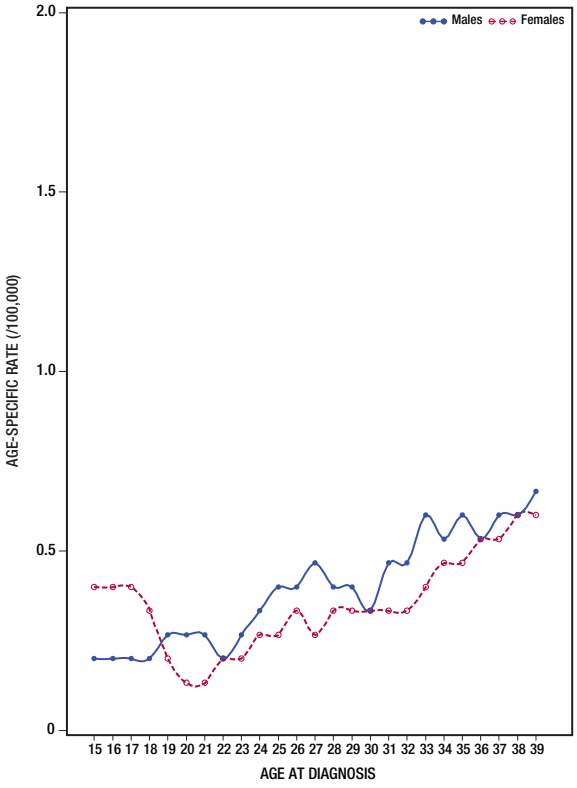


FIGURE 2. TREND IN AGE-ADJUSTED INCIDENCE RATE BY SEX FOR AYA ASTROCYTOMA NOS IN LOS ANGELES COUNTY, 1988-2011

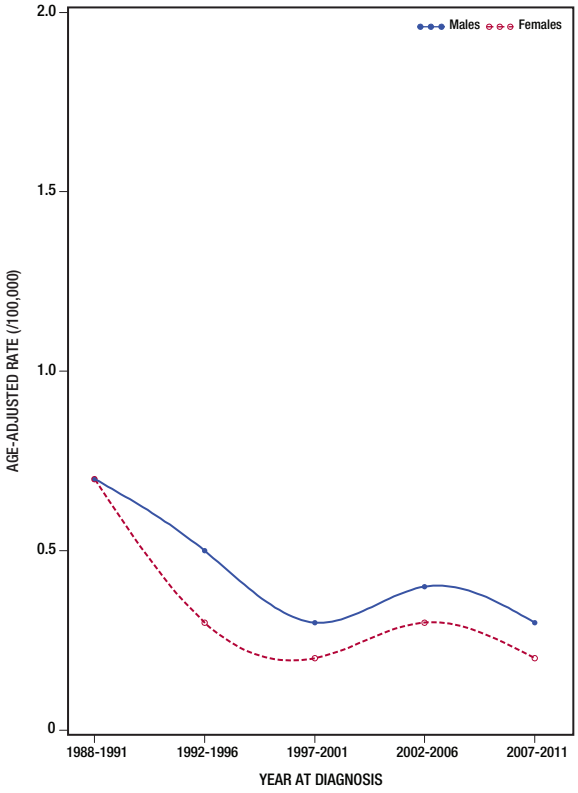


FIGURE 3. TREND IN AGE-SPECIFIC RATE BY SEX FOR AYA ASTROCYTOMA NOS IN LOS ANGELES COUNTY, 1988-2011

FIG 3(A): MALES

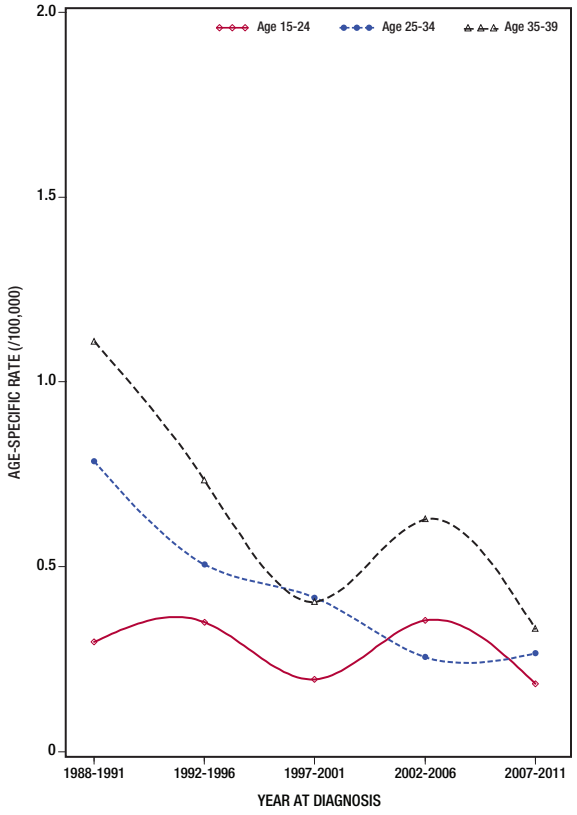


FIG 3(B): FEMALES

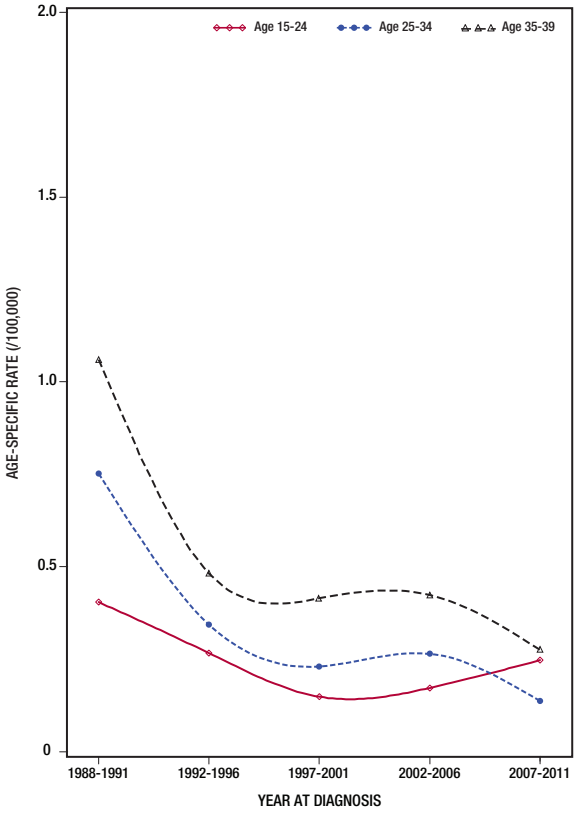


FIGURE 4. AGE-ADJUSTED INCIDENCE RATE BY RACE/ETHNICITY FOR AYA ASTROCYTOMA NOS IN LOS ANGELES COUNTY, 1988-2011

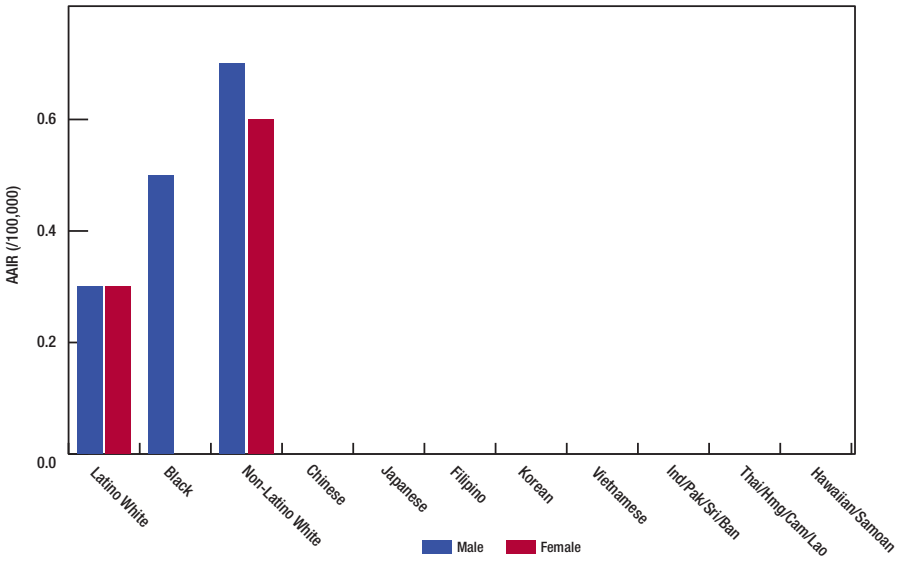


FIGURE 5. AGE-ADJUSTED INCIDENCE RATE BY SES BY RACE/ETHNICITY FOR AYA ASTROCYTOMA NOS IN LOS ANGELES COUNTY, 1988-2011

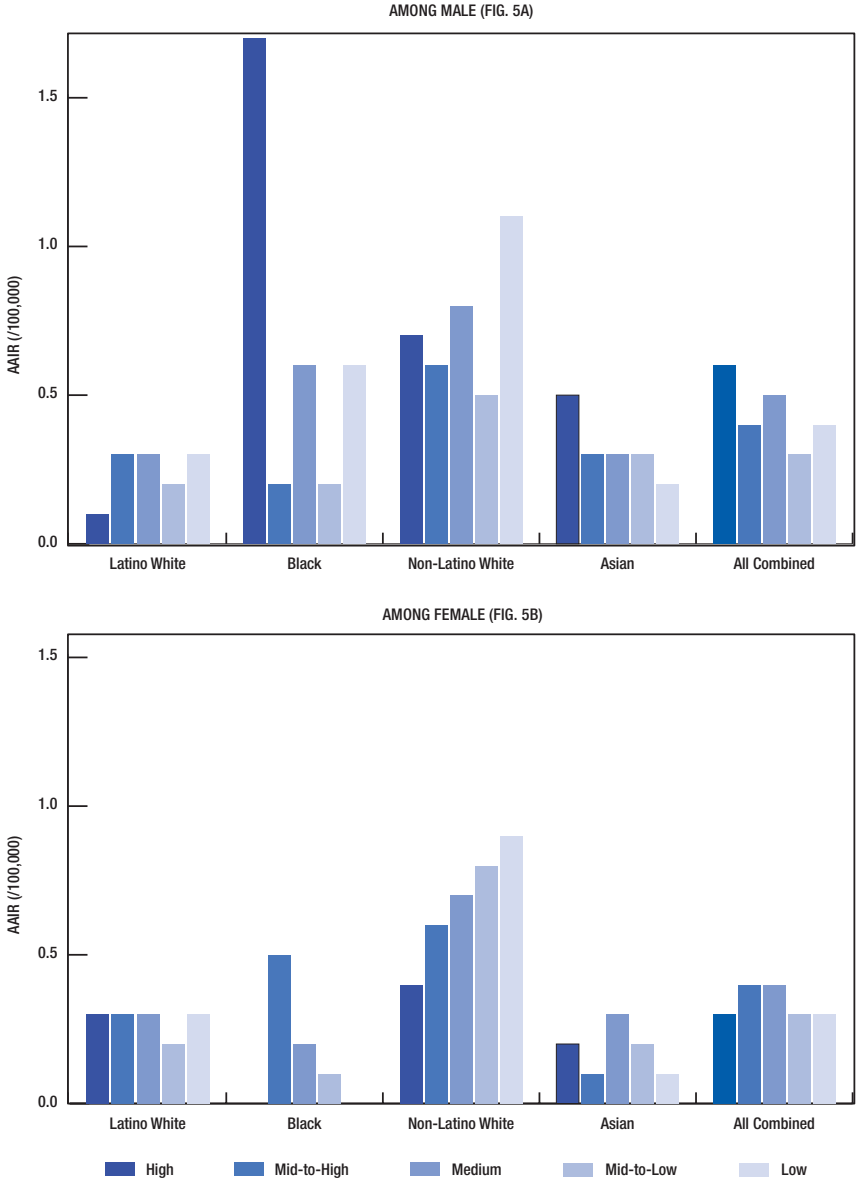
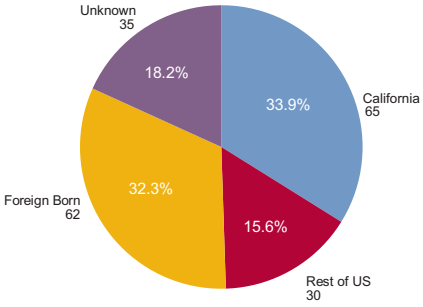
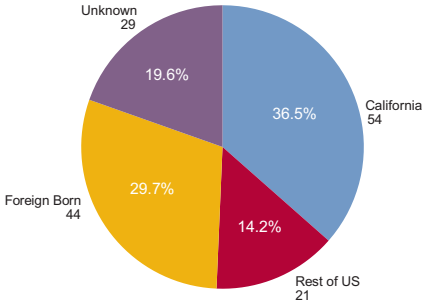


FIGURE 6. FREQUENCY DISTRIBUTION OF BIRTH PLACE FOR AYA ASTROCYTOMA NOS BY SEX IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 6A)

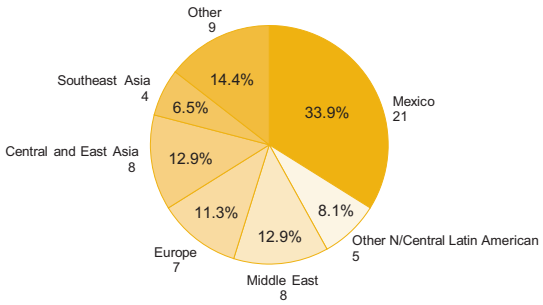


FEMALE (FIG. 6B)



AMONG FOREIGN BORN

MALE (FIG. 6C)



FEMALE (FIG. 6D)

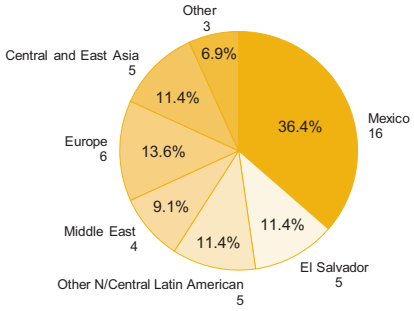
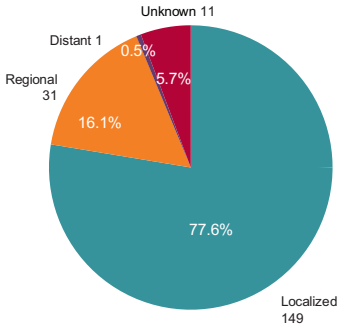


FIGURE 7. DISTRIBUTION OF STAGE OF DISEASE BY SEX FOR AYA ASTROCYTOMA NOS IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 7A)



FEMALE (FIG. 7B)

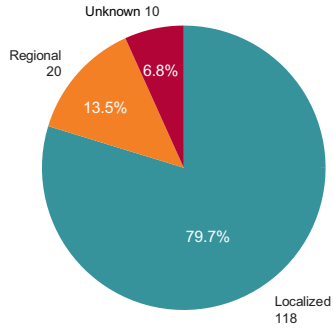


TABLE 1.
AGE-ADJUSTED INCIDENCE RATE BY AGE FOR AYA OTHER SPECIFIED INTRACRANIAL AND INTRASPINAL NEOPLASMS IN LOS ANGELES COUNTY, 1988-2011

	Males		Females	
Age Group	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
15-24	61	0.3 (0.2–0.4)	68	0.4 (0.3–0.5)
25-34	130	0.7 (0.6–0.8)	196	1.1 (0.9–1.2)
35-39	127	1.4 (1.2–1.6)	210	2.4 (2.0–2.7)
All Ages 15-39	**318**	**0.7 (0.6–0.8)**	**474**	**1.1 (1.0–1.2)**

TABLE 2. AGE-ADJUSTED INCIDENCE RATE BY AGE AND RACE/ETHNICITY FOR AYA OTHER SPECIFIED INTRACRANIAL AND INTRASPINAL NEOPLASMS IN LOS ANGELES COUNTY, 1988-2011

MALES								
	All Ages 15-24		**All Ages 25-34**		**All Ages 35-39**		**All Ages 15-39**	
Race/Ethnicity	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
Latino White	32	0.3 (0.2-0.5)	55	0.6 (0.5-0.8)	42	1.1 (0.8-1.5)	129	0.6 (0.5-0.7)
Black	<20	—	<20	—	<20	—	21	0.5 (0.3-0.8)
Non-Latino White	<20	—	47	0.8 (0.5-1.0)	55	1.7 (1.3-2.2)	118	0.8 (0.7-1.0)
Chinese	<20	—	<20	—	<20	—	<20	—
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	<20	—
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—
FEMALES								
Latino White	31	0.4 (0.2-0.5)	70	0.9 (0.7-1.1)	80	2.2 (1.8-2.7)	181	1.0 (0.8-1.1)
Black	<20	—	27	1.4 (0.9-1.9)	<20	—	53	1.1 (0.8-1.4)
Non-Latino White	<20	—	73	1.3 (1.0-1.6)	79	2.7 (2.1-3.3)	167	1.2 (1.0-1.4)
Chinese	<20	—	<20	—	<20	—	<20	—
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	<20	—
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—

FIGURE 1. AGE-SPECIFIC RATE BY SEX FOR AYA OTHER SPECIFIED INTRACRANIAL AND INTRASPINAL NEOPLASMS IN LOS ANGELES COUNTY, 1988-2011

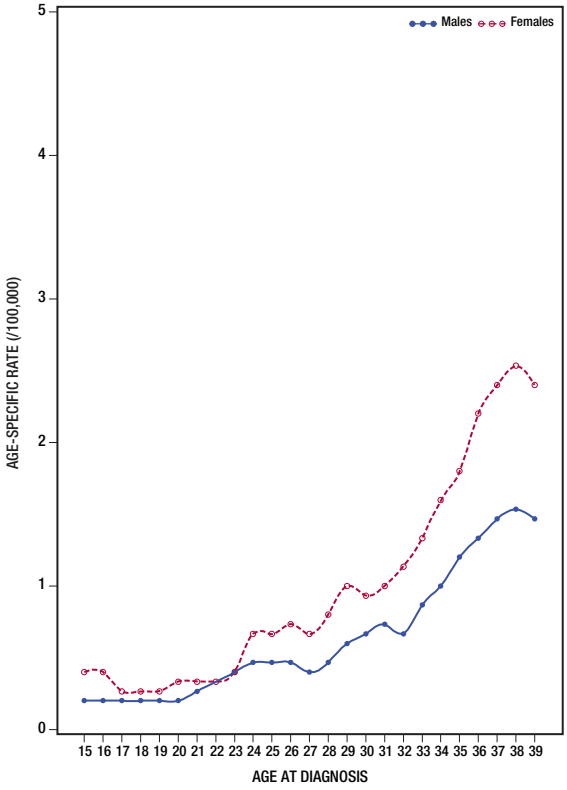


FIGURE 2. TREND IN AGE-ADJUSTED INCIDENCE RATE BY SEX FOR AYA OTHER SPECIFIED INTRACRANIAL AND INTRASPINAL NEOPLASMS IN LOS ANGELES COUNTY, 1988-2011

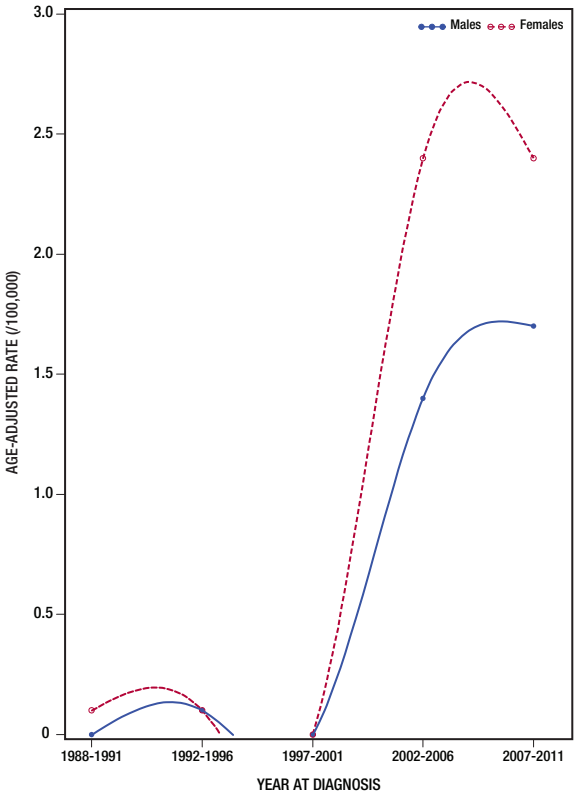


FIGURE 3. TREND IN AGE-SPECIFIC RATE BY SEX FOR AYA OTHER SPECIFIED INTRACRANIAL AND INTRASPINAL NEOPLASMS IN LOS ANGELES COUNTY, 1988-2011

FIG 3(A): MALES

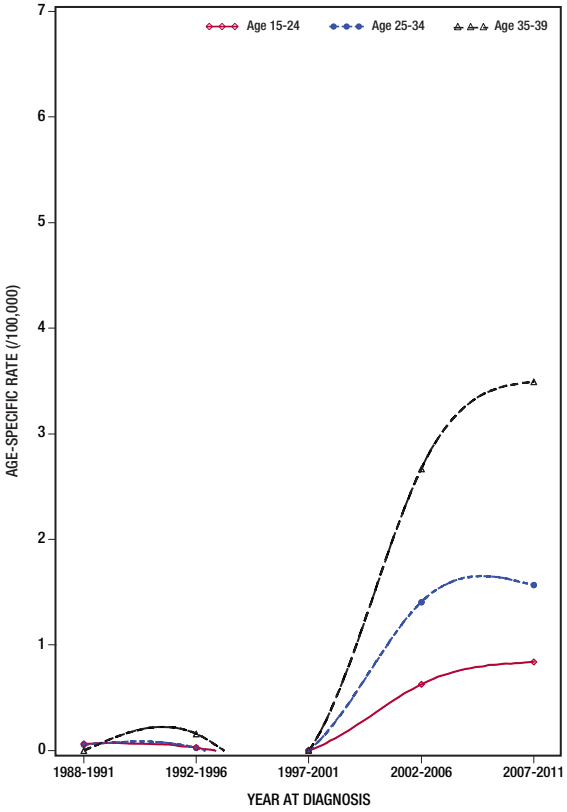


FIG 3(B): FEMALES

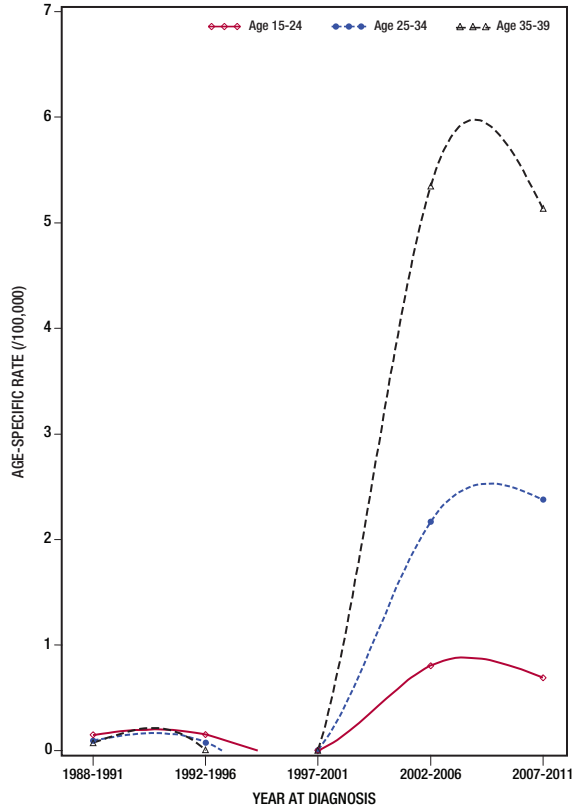


FIGURE 4. AGE-ADJUSTED INCIDENCE RATE BY RACE/ETHNICITY FOR AYA OTHER SPECIFIED INTRACRANIAL AND INTRASPINAL NEOPLASMS IN LOS ANGELES COUNTY, 1988-2011

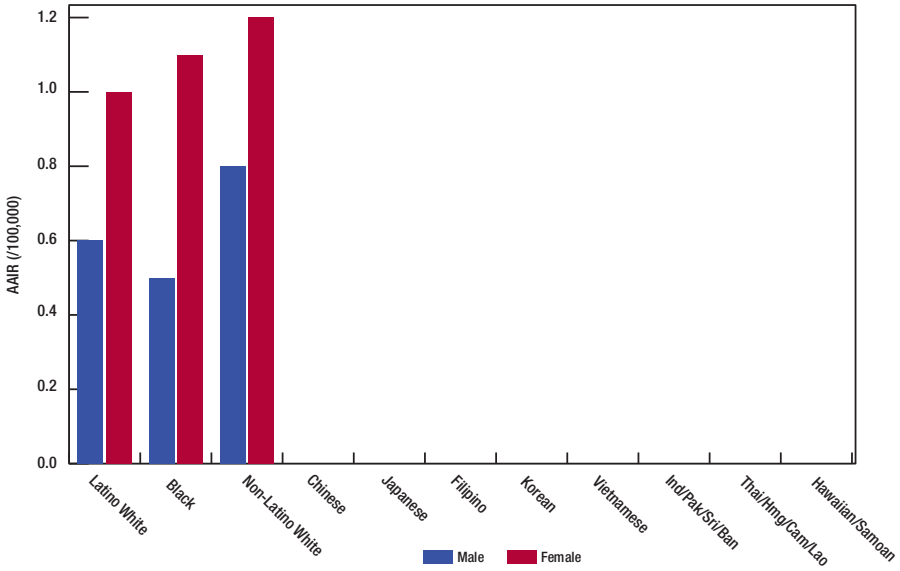


FIGURE 5. AGE-ADJUSTED INCIDENCE RATE BY SES BY RACE/ETHNICITY FOR AYA OTHER SPECIFIED INTRACRANIAL AND INTRASPINAL NEOPLASMS IN LOS ANGELES COUNTY, 1988-2011

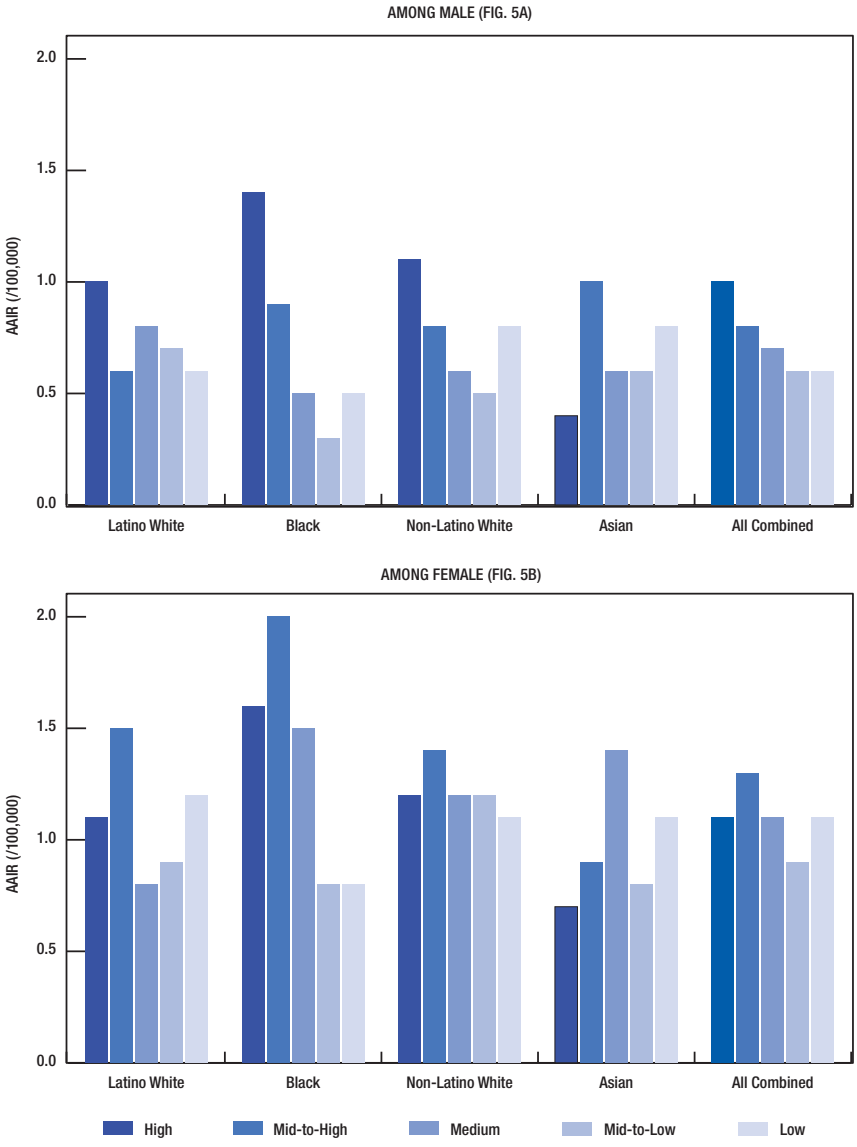
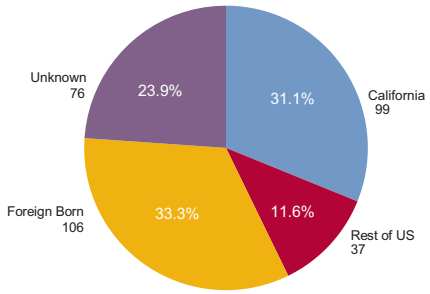
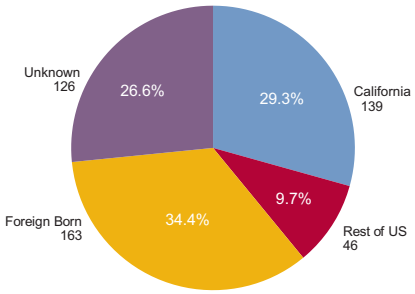


FIGURE 6. FREQUENCY DISTRIBUTION OF BIRTH PLACE FOR AYA OTHER SPECIFIED INTRACRANIAL AND INTRASPINAL NEOPLASMS BY SEX IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 6A)

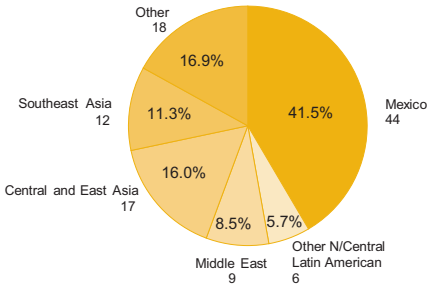


FEMALE (FIG. 6B)



AMONG FOREIGN BORN

MALE (FIG. 6C)



FEMALE (FIG. 6D)

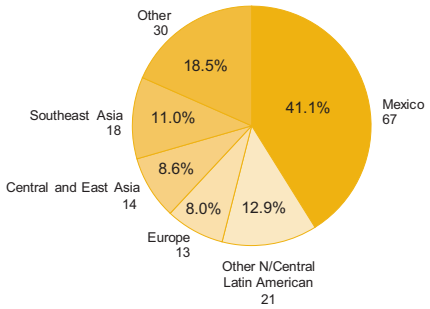
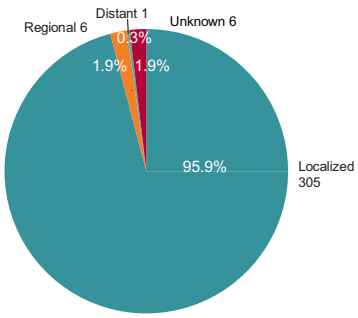
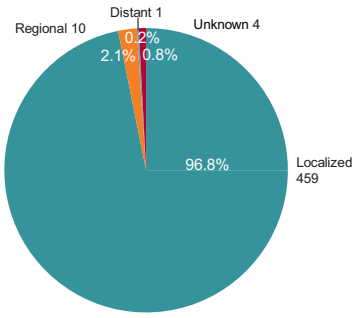


FIGURE 7. FREQUENCY DISTRIBUTION OF STAGE OF DISEASE BY SEX FOR AYA OTHER SPECIFIED INTRACRANIAL AND INTRASPINAL NEOPLASMS IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 7A)



FEMALE (FIG. 7B)



BREAST

Kathleen Meeske, PhD

Breast cancer is the most common cancer among females worldwide. Rates tend to be higher in developed countries than in developing countries. In the U.S., among women of all ages breast cancer is the second most common cancer (approximately 234,580 cases of invasive breast cancer per year), following skin cancers. Rates are highest for non-Latino whites and blacks and lowest for Asian American/Pacific Islanders. While new immigrants in the U.S. have rates similar to their home country, rates for second and third generations tend to rise.

Breast cancer is the most frequently diagnosed cancer among AYA females and accounts for approximately 14% of all AYA cancer diagnoses and 5 to 6% of breast cancer at all ages. There are significant biological differences in breast cancers among AYA females and older females. AYA females have more aggressive tumors and poorer prognosis.

Risk factors for breast cancer include being female, a family history of breast cancer (BRCA1, BRCA2 gene mutations), early onset of menstruation, never having a full term pregnancy, having first full term pregnancy after age 30, radiation therapy to the breast or chest, high SES and alcohol intake. Obesity and parity are risk factors that are related to age at diagnosis. For example, obesity increases older females' risk of breast cancer and decreases risk among younger females (<40 years). Similarly, having children increases a young woman's risk of breast cancer and decreases an older woman's breast cancer risk.

Breast cancer is the second most common cause of cancer-related death for females in the U.S. Among females aged 15-39, breast cancer is the leading cause of cancer-related deaths. Five-year survival rates are lowest for this age group. AYA females tend to be diagnosed with more aggressive tumors and advanced disease. Diagnosing breast cancer in young females is more difficult because of the increased density of their breast tissue. Mammography is not an effective screening tool for this age group.

RATES BY AGE AND SEX AND TIME TRENDS

Due to the small number of breast cancer cases among males, the information described is only about females. In Los Angeles County, approximately 340 AYA females are diagnosed with breast cancer each year. Breast cancer is the most common cancer among AYA females, representing 27% of all cancers diagnosed among AYA females. Incidence rates increase with age with 62% of all AYA breast cancer cases occurring among females 35-39 years of age. Incidence rates for breast cancer in Los Angeles County have remained relatively stable for AYA females during years 1988 to 2011.

RATES BY RACE/ETHNICITY, SOCIOECONOMIC STATUS AND BIRTHPLACE

Among AYA females, breast cancer rates are highest for blacks, non-Latino whites, Filipinas, and Vietnamese (Table 2 and Figure 4). There is a strong relationship between SES and breast cancer with the more affluent having higher rates (Figure 5). This relationship between SES and breast cancer is present for all race/ethnic groups. While information regarding birthplace is unavailable for 22% of the AYA breast cancer cases diagnosed in Los Angeles County, 43% of the cases were born in the U.S. and 35% were born outside the U.S. (Figure 6). Sixty-two percent of U.S. born females were born in California. Among the females not born in the U.S., 50% were born in Mexico, El Salvador and other countries in North and Central America, and 26% in Southeast, Central and East Asia.

RATES BY STAGE AT DIAGNOSIS

In the U.S., 61% of females with breast cancer are diagnosed with localized disease. In Los Angeles County, 48% of the AYAs are diagnosed with localized disease (Figure 7). Females 35 to 39 years of age are more likely to be diagnosed with localized disease than those aged 15 to 34 years (data not shown).

TABLE 1.
AGE-ADJUSTED INCIDENCE RATE BY AGE FOR AYA CARCINOMA OF BREAST IN LOS ANGELES COUNTY, 1988-2011

Age Group	N	AAIR (95%CI)
15-24	104	0.6 (0.5–0.7)
25-34	2,858	15.7 (15.1–16.3)
35-39	4,900	54.9 (53.4–56.5)
All Ages 15-39	**7,862**	**18.7 (18.3–19.1)**

TABLE 2. AGE-ADJUSTED INCIDENCE RATE BY AGE AND RACE/ETHNICITY FOR AYA CARCINOMA OF BREAST IN LOS ANGELES COUNTY, 1988-2011

FEMALES								
	All Ages 15-24		All Ages 25-34		All Ages 35-39		All Ages 15-39	
Race/Ethnicity	N	AAIR (95%CI)	N	AAIR (95%CI)	N	AAIR (95%CI)	N	AAIR (95%CI)
Latino White	43	0.5 (0.3-0.6)	1,008	12.8 (12.0-13.6)	1,534	43.0 (40.9-45.2)	2,585	14.9 (14.3-15.4)
Black	<20	—	399	20.9 (18.9-23.0)	658	68.7 (63.4-73.9)	1,074	24.0 (22.5-25.4)
Non-Latino White	27	0.6 (0.4-0.8)	1,051	18.6 (17.5-19.8)	1,952	66.3 (63.4-69.3)	3,030	22.4 (21.6-23.2)
Chinese	<20	—	89	13.3 (10.5-16.1)	180	49.0 (41.8-56.2)	271	16.4 (14.4-18.3)
Japanese	<20	—	43	17.3 (12.1-22.5)	69	51.9 (39.7-64.2)	112	18.4 (15.0-21.8)
Filipino	<20	—	100	17.9 (14.4-21.5)	193	64.4 (55.3-73.5)	300	22.0 (19.5-24.5)
Korean	<20	—	48	12.1 (8.7-15.5)	92	44.6 (35.5-53.7)	143	15.1 (12.6-17.6)
Vietnamese	<20	—	25	15.0 (9.1-20.9)	55	63.0 (46.3-79.6)	83	20.8 (16.3-25.3)
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	23	12.7 (7.5-18.0)	29	38.4 (24.4-52.4)	53	13.9 (10.1-17.7)
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	24	39.7 (23.8-55.6)	39	13.7 (9.4-18.1)
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—

FIGURE 1. AGE-SPECIFIC RATE FOR AYA CARCINOMA OF BREAST IN LOS ANGELES COUNTY, 1988-2011

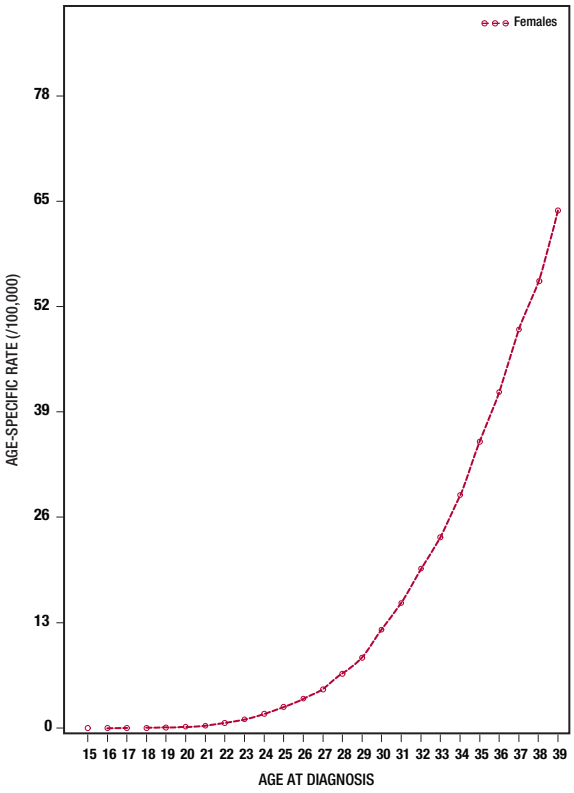


FIGURE 2. TREND IN AGE-ADJUSTED INCIDENCE RATE FOR AYA CARCINOMA OF BREAST IN LOS ANGELES COUNTY, 1988-2011

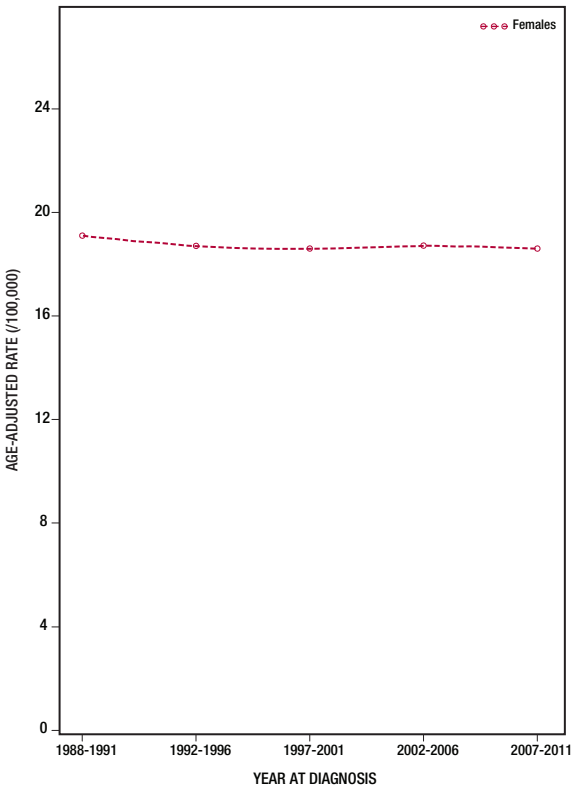


FIGURE 3. TREND IN AGE-SPECIFIC RATE FOR AYA CARCINOMA OF BREAST IN LOS ANGELES COUNTY, 1988-2011

FIG 3(B): FEMALES

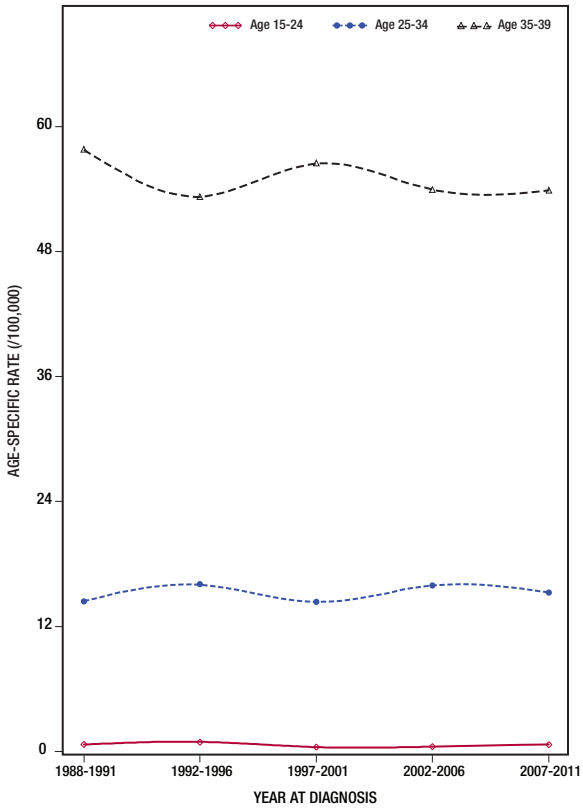


FIGURE 4. AGE-ADJUSTED INCIDENCE RATE BY RACE/ETHNICITY FOR AYA CARCINOMA OF BREAST IN LOS ANGELES COUNTY, 1988-2011

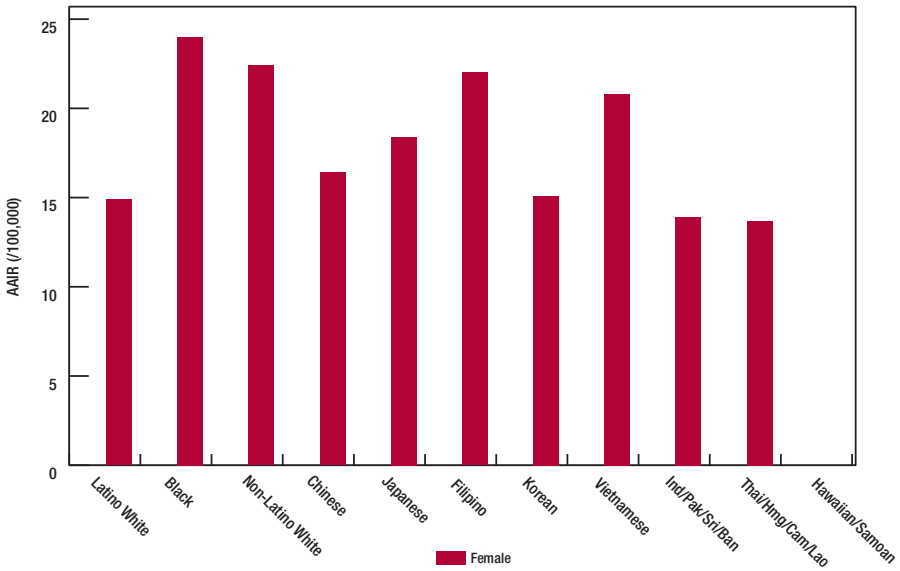


FIGURE 5. AGE-ADJUSTED INCIDENCE RATE BY SES BY RACE/ETHNICITY FOR AYA CARCINOMA OF BREAST IN LOS ANGELES COUNTY, 1988-2011

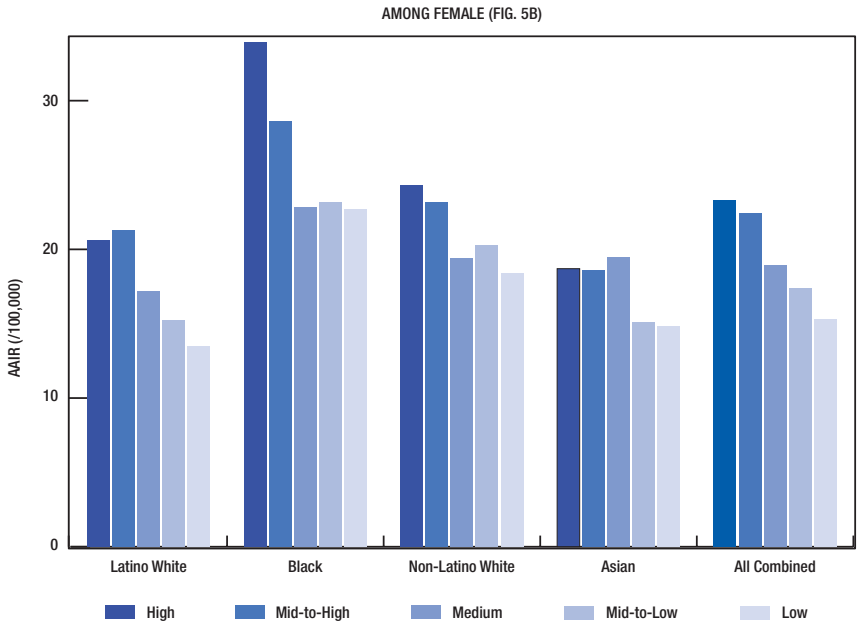
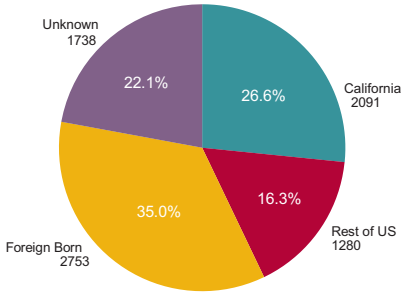


FIGURE 6. FREQUENCY DISTRIBUTION OF BIRTH PLACE FOR AYA CARCINOMA OF BREAST IN LOS ANGELES COUNTY, 1988-2011



AMONG FOREIGN BORN

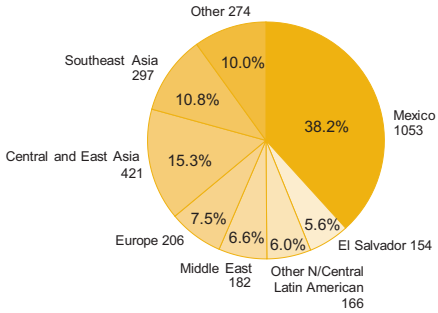
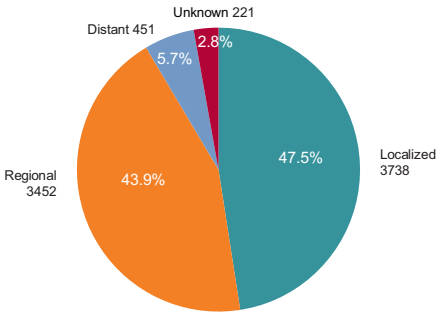


FIGURE 7. FREQUENCY DISTRIBUTION OF STAGE OF DISEASE FOR AYA CARCINOMA OF BREAST IN LOS ANGELES COUNTY, 1988-2011

FEMALE (FIG. 7B)



CERVIX AND UTERUS

Lihua Liu, PhD

The uterus is where a fetus grows when a woman is pregnant. The *cervix* is the lower neck of the uterus, connecting the uterus to the vagina; the upper body of the uterus is called *corpus* or simply *uterus*. Cancer that begins in the lining of the cervix is called cervical cancer, while cancer developing in the lining of the uterus (endometrium) is referred to as endometrial or uterus cancer. However, cervical cancer and uterus cancer are different diseases with different risk factors, incidence patterns, detection methods, and survival rates. Every year in the U.S., among women of all ages over 12,000 new cervical cancers and close to 50,000 new uterus cancers are diagnosed, with more than 4,000 deaths caused by cervical cancer and over 8,000 by uterus cancer.

The most important risk factor for cervical cancer is infection by human papilloma virus (HPV). HPV is commonly transmitted by sexual contact. Many women may have HPV, but only very few will develop cervical cancer. Other risk factors for cervical cancer include having sex at an early age, many sex partners, unprotected sex, smoking, poor nutrition, overweight, and a weakened immune system. Most cervical cancer cases are found in women under age 50. It rarely occurs in women younger than age 20. National guidelines for annual Pap tests for women 21 years of age and older and HPV vaccination for girls and boys aged 9 years and older have effectively improved the early detection and prevention of cervical cancer. The five-year relative survival rate for cervical cancer of all stages combined is 68%, but for localized early-stage cervical cancer the rate is 91%.

Cancer of the uterus occurs more frequently in women who have an imbalance of reproductive hormones, particularly estrogen. Risk factors for uterus cancer include use of hormone replacement therapy with estrogen without progesterone, diabetes, hypertension, tamoxifen use and later age of menopause. One of the strongest risk factors for the development of uterus cancer is obesity, because women who are obese have higher circulating levels of estrogen. Heredity also plays a role in a small percentage of women with uterus cancer. Having children tends to reduce a woman's risk of this disease. Uterus cancer is rarely seen in women under 40 and is far more common in women over 60. However, incidence of uterus cancer among young women is on the rise, possibly due to increasing rates of obesity. Uterus cancer is highly curable if diagnosed at an early stage. However, there are no reliable routine tests for uterus cancer, resulting often in delayed diagnosis and reduced survival.

RATES BY AGE AND SEX AND TIME TRENDS

During 1988-2011, approximately 145 cervical cancers and 40 uterine cancers were diagnosed every year among AYA women aged 15-39 years living in Los Angeles County. The annual average age-adjusted incidence rate is higher for cervical cancer than for uterine cancer (Table 1). The risk of developing either cancer increases with age, more so for cervical cancer than for uterus cancer (Figure 1). Rates decrease for cervical cancer while increasing for uterus cancer (Figure 2). These opposing incidence trends are seen across age groups (Figure 3). There are considerable differences by race/ethnicity, with the highest cervical cancer rates in Latina whites and lowest in Chinese, while the highest uterine cancer rates are found in Filipinas and lowest in blacks (Table 2 and Figure 4).

RATES BY RACE/ETHNICITY, SOCIOECONOMIC STATUS AND BIRTHPLACE

Rates of both cervical and uterus cancer are higher among lower SES groups, especially among Latina white and non-Latina whites (Figure 5). Compared to females diagnosed with uterine cancer, those with cervical cancer were more likely to be foreign born (44% vs. 35%) (Figure 6a) and from Mexico (50% vs. 46%), El Salvador (14% vs. 9%), and other North/Central American countries (14% vs. 7%) (Figure 6b).

RATES BY STAGE AT DIAGNOSIS

Fewer cervical cancers are diagnosed at localized stage than uterine cancer (66% vs. 75%), and more cervical cancers are of regional (24% vs. 13%) and distant (5% vs. 4%) stages (Figures 7, pg. 73, 77). Given the effective screening for cervical cancer by Pap test and the available HPV vaccine, more educational outreach should be implemented to reduce the cervical cancer burden among the AYA populations.

TABLE 1.
AGE-ADJUSTED INCIDENCE RATE BY AGE FOR AYA CARCINOMA OF CERVIX IN LOS ANGELES COUNTY, 1988-2011

Age Group	N	AAIR (95%CI)
15-24	142	0.8 (0.7–0.9)
25-34	1,729	9.4 (8.9–9.8)
35-39	1,614	18.1 (17.2–19.0)
All Ages 15-39	**3,485**	**8.0 (7.7–8.3)**

TABLE 2. AGE-ADJUSTED INCIDENCE RATE BY AGE AND RACE/ETHNICITY FOR AYA CARCINOMA OF CERVIX IN LOS ANGELES COUNTY, 1988-2011

FEMALES								
	All Ages 15-24		All Ages 25-34		All Ages 35-39		All Ages 15-39	
Race/Ethnicity	N	AAIR (95%CI)	N	AAIR (95%CI)	N	AAIR (95%CI)	N	AAIR (95%CI)
Latino White	68	0.8 (0.6-1.0)	955	11.9 (11.2-12.7)	868	24.4 (22.7-26.0)	1,891	10.4 (9.9-10.9)
Black	<20	—	155	8.1 (6.8-9.3)	153	16.0 (13.4-18.5)	327	7.1 (6.3-7.9)
Non-Latino White	43	0.9 (0.6-1.2)	487	8.6 (7.8-9.3)	424	14.4 (13.0-15.8)	954	6.9 (6.5-7.4)
Chinese	<20	—	<20	—	29	7.9 (5.0-10.8)	44	2.6 (1.9-3.4)
Japanese	<20	—	<20	—	21	15.8 (9.0-22.6)	36	5.9 (4.0-7.8)
Filipino	<20	—	24	4.3 (2.6-6.0)	34	11.3 (7.5-15.2)	60	4.4 (3.3-5.5)
Korean	<20	—	<20	—	32	15.5 (10.1-20.9)	50	5.3 (3.8-6.8)
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—

FIGURE 1. AGE-SPECIFIC RATE FOR AYA CARCINOMA OF CERVIX IN LOS ANGELES COUNTY, 1988-2011

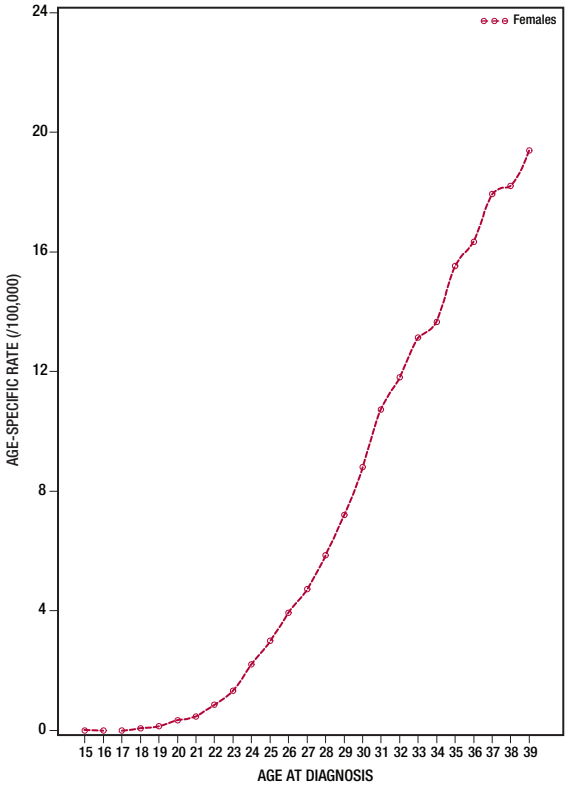


FIGURE 2. TREND IN AGE-ADJUSTED INCIDENCE RATE FOR AYA CARCINOMA OF CERVIX IN LOS ANGELES COUNTY, 1988-2011

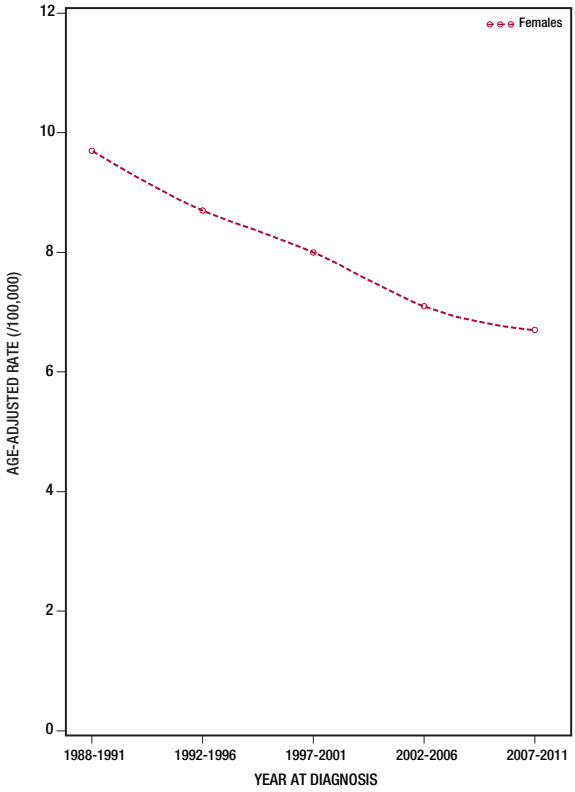


FIGURE 3. TREND IN AGE-SPECIFIC RATE FOR AYA CARCINOMA OF CERVIX IN LOS ANGELES COUNTY, 1988-2011

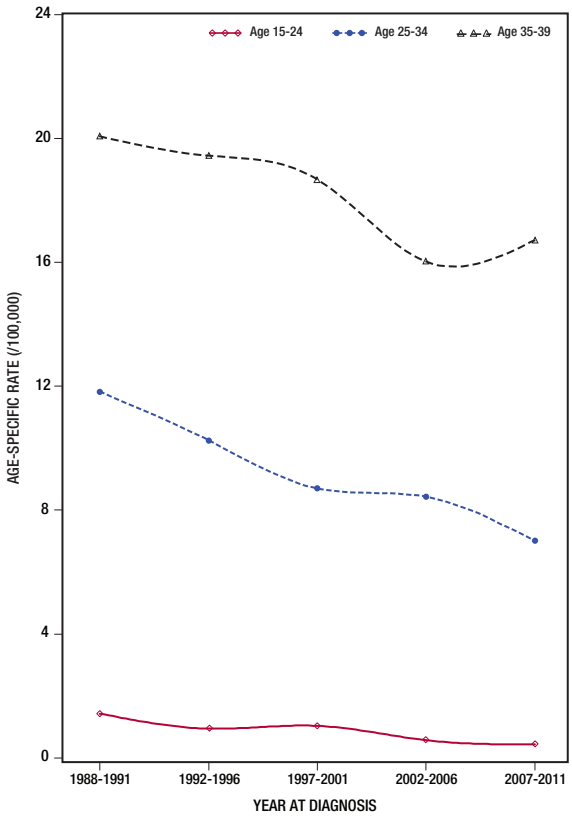


FIGURE 4. AGE-ADJUSTED INCIDENCE RATE BY RACE/ETHNICITY FOR AYA CARCINOMA OF CERVIX IN LOS ANGELES COUNTY, 1988-2011

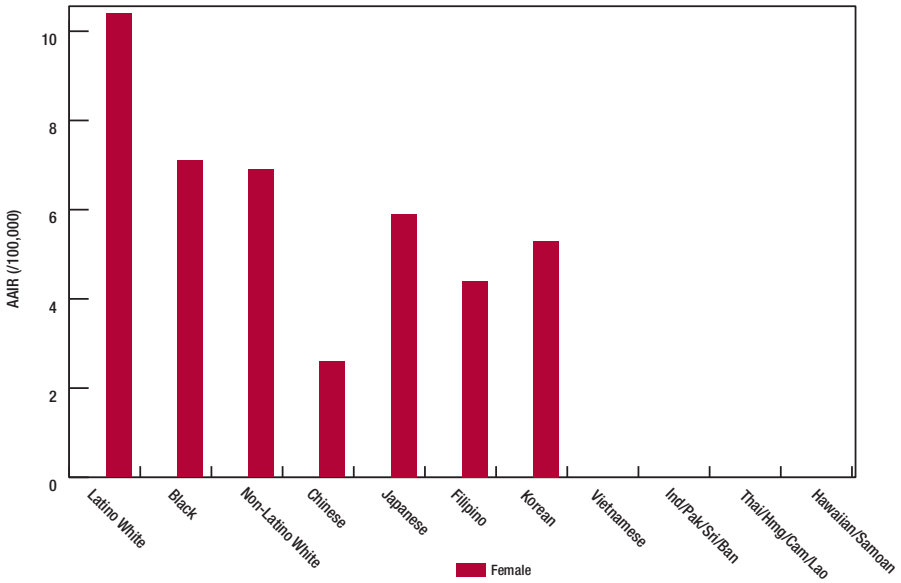


FIGURE 5. AGE-ADJUSTED INCIDENCE RATE BY SES BY RACE/ETHNICITY FOR AYA CARCINOMA OF CERVIX IN LOS ANGELES COUNTY, 1988-2011

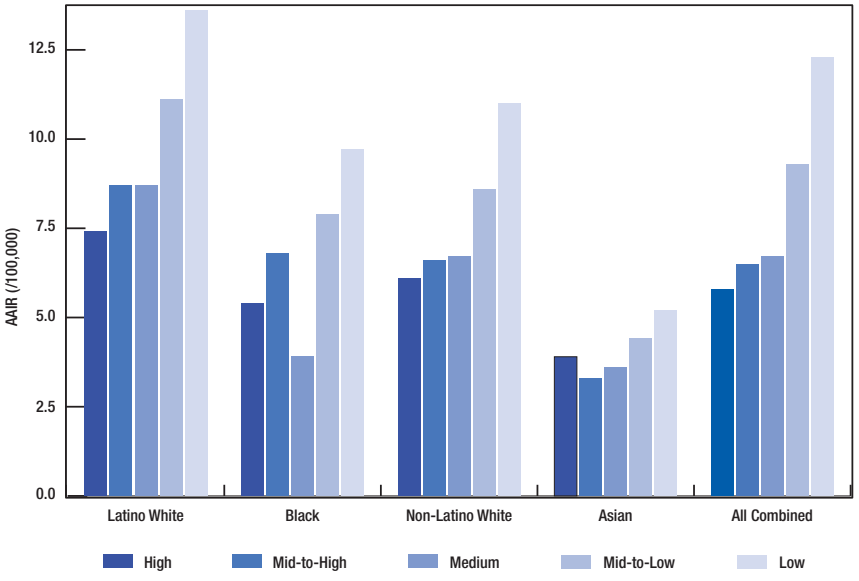


FIGURE 6. FREQUENCY DISTRIBUTION OF BIRTH PLACE FOR AYA CARCINOMA OF CERVIX IN LOS ANGELES COUNTY, 1988-2011

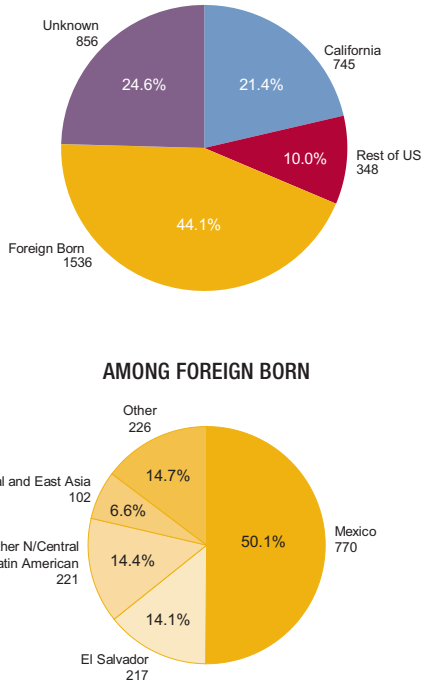


FIGURE 7. FREQUENCY DISTRIBUTION OF STAGE OF DISEASE FOR AYA CARCINOMA OF CERVIX IN LOS ANGELES COUNTY, 1988-2011

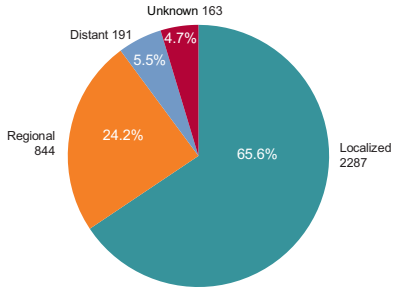


TABLE 1.
AGE-ADJUSTED INCIDENCE RATE BY AGE FOR AYA CARCINOMA OF UTERUS IN LOS ANGELES COUNTY, 1988-2011

Age Group	N	AAIR (95%CI)
15-24	23	0.1 (0.1–0.2)
25-34	405	2.2 (2.0–2.4)
35-39	524	5.9 (5.4–6.4)
All Ages 15-39	**952**	**2.2 (2.1–2.4)**

TABLE 2. AGE-ADJUSTED INCIDENCE RATE BY AGE AND RACE/ETHNICITY FOR AYA CARCINOMA OF UTERUS IN LOS ANGELES COUNTY, 1988-2011

FEMALES								
	All Ages 15-24		All Ages 25-34		All Ages 35-39		All Ages 15-39	
Race/Ethnicity	N	AAIR (95%CI)	N	AAIR (95%CI)	N	AAIR (95%CI)	N	AAIR (95%CI)
Latino White	<20	—	240	3.0 (2.6-3.4)	239	6.7 (5.9-7.6)	497	2.7 (2.5-3.0)
Black	<20	—	20	1.1 (0.6-1.5)	27	2.8 (1.8-3.9)	47	1.0 (0.7-1.3)
Non-Latino White	<20	—	85	1.5 (1.2-1.8)	148	5.0 (4.2-5.8)	234	1.7 (1.5-1.9)
Chinese	<20	—	<20	—	<20	—	30	1.8 (1.2-2.5)
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	20	3.6 (2.0-5.2)	30	10.0 (6.4-13.6)	51	3.7 (2.7-4.7)
Korean	<20	—	<20	—	<20	—	20	2.1 (1.2-3.1)
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—

FIGURE 1. AGE-SPECIFIC RATE FOR AYA CARCINOMA OF UTERUS IN LOS ANGELES COUNTY, 1988-2011

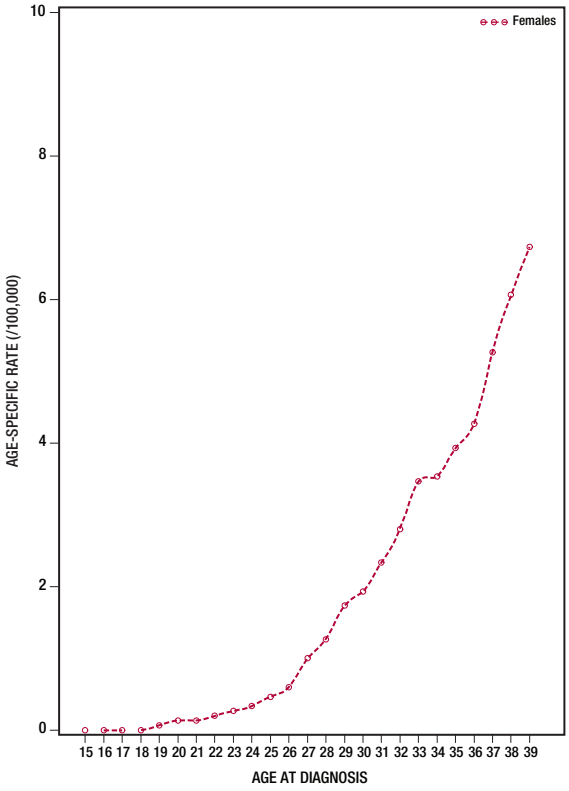


FIGURE 2. TREND IN AGE-ADJUSTED INCIDENCE RATE FOR AYA CARCINOMA OF UTERUS IN LOS ANGELES COUNTY, 1988-2011

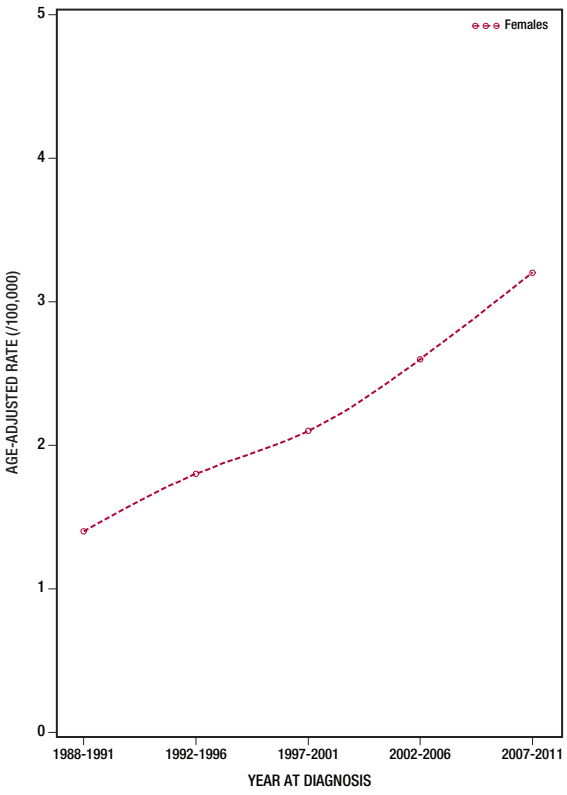


FIGURE 3. TREND IN AGE-SPECIFIC RATE FOR AYA CARCINOMA OF UTERUS IN LOS ANGELES COUNTY, 1988-2011

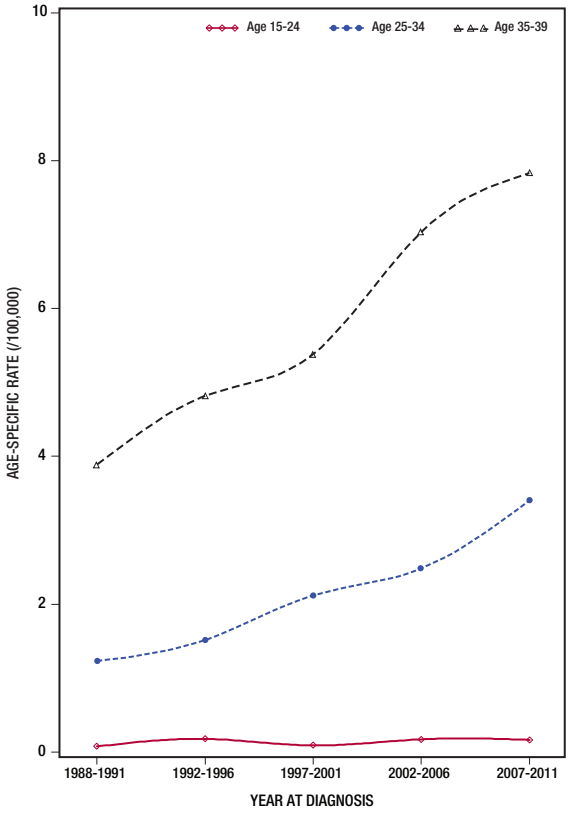


FIGURE 4. AGE-ADJUSTED INCIDENCE RATE BY RACE/ETHNICITY FOR AYA CARCINOMA OF UTERUS IN LOS ANGELES COUNTY, 1988-2011

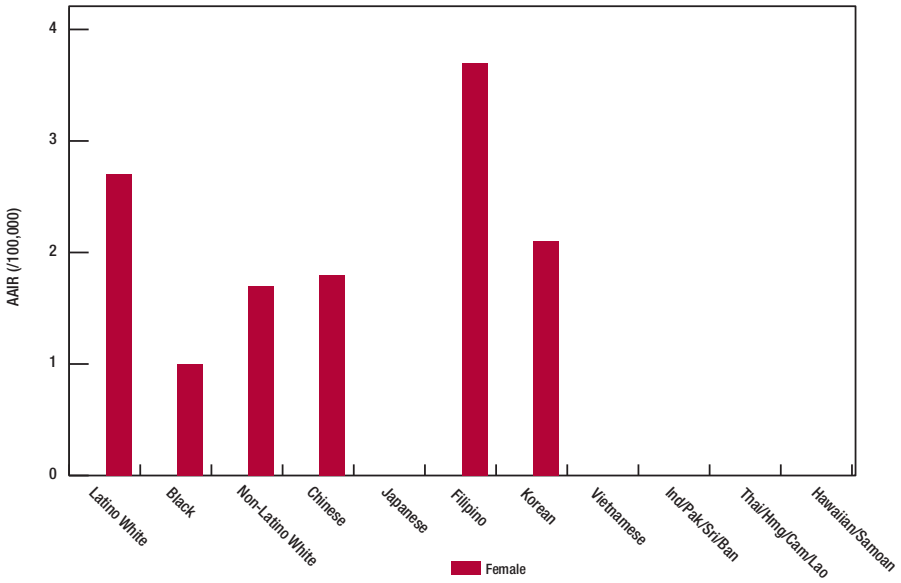


FIGURE 5. AGE-ADJUSTED INCIDENCE RATE BY SES BY RACE/ETHNICITY FOR AYA CARCINOMA OF UTERUS IN LOS ANGELES COUNTY, 1988-2011

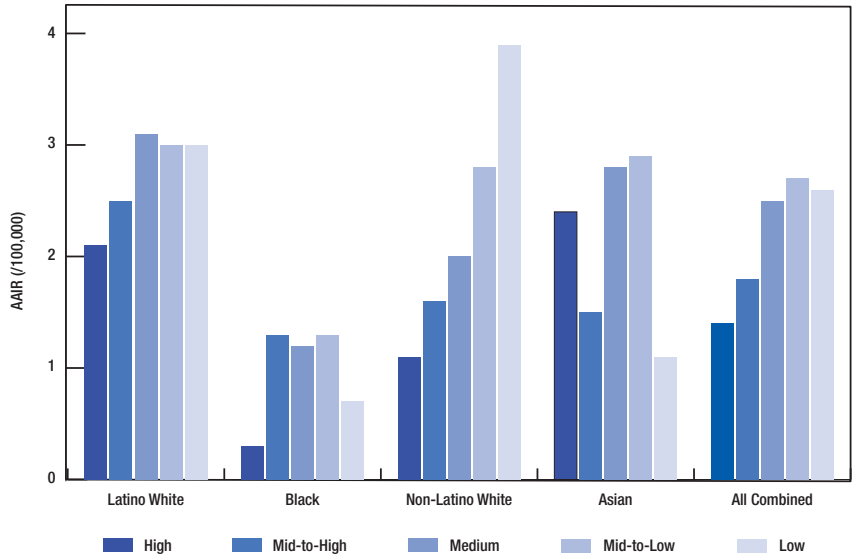
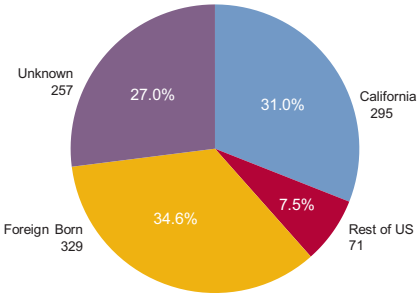


FIGURE 6. FREQUENCY DISTRIBUTION OF BIRTH PLACE FOR AYA CARCINOMA OF UTERUS IN LOS ANGELES COUNTY, 1988-2011



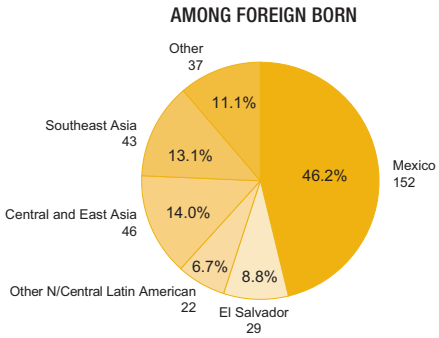
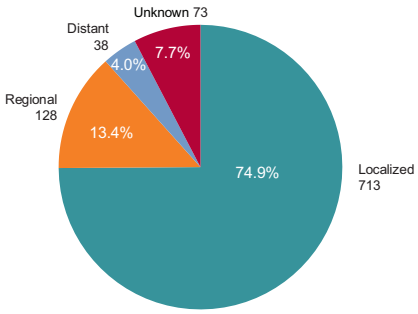


FIGURE 7. FREQUENCY DISTRIBUTION OF STAGE OF DISEASE FOR AYA CARCINOMA OF UTERUS IN LOS ANGELES COUNTY, 1988-2011



COLON AND RECTUM

Dennis Deapen, DrPH

Colorectal cancer is the third most common cancer in the U.S. and the third highest site for cancer deaths. Among AYAs, it is the 6th most common cancer among males (5% of all AYA cancers) and 7th for females (3% of all AYA cancers). Overall, the rates of colorectal cancer have been declining among all race/ethnic groups and both sexes since the 1980s, but we do not see this among AYAs. While screening efforts contribute to both declining incidence and deaths, screening is not recommended in the AYA population.

Factors that can lower risk of colorectal cancer include:

- colorectal cancer screening
- regular use of aspirin, ibuprofen, naproxen and similar drugs
- maintaining a healthy weight
- regular, vigorous exercise (activities that cause sweating and heavy breathing)
- a diet high in vegetables
- hormone replacement therapy use in women.

Factors that can increase risk of colorectal cancer include:

- close relatives (parents, brothers, sisters, or children) who have had colorectal cancer
- history of colorectal polyps
- obesity
- cigarette smoking
- inactive lifestyle.

RATES BY AGE AND SEX AND TIME TRENDS

In Los Angeles County, approximately 95 cases of colorectal cancer are diagnosed among AYAs each year. Incidence is higher among males than females at all ages (Figures 1 and 3). Between 1988 and 2011, the age-adjusted incidence rate for colorectal cancer among AYAs showed a slight increase since 1988 (Figure 2).

RATES BY RACE/ETHNICITY, SOCIOECONOMIC STATUS AND BIRTHPLACE

The highest colorectal cancer rates in AYAs are among Vietnamese males and females (5.6 per 100,000) (Table 2 and Figure 4) although these are based on a small number of cases. No consistent patterns by socioeconomic status are observed (Figure 5).

While birthplace information is unavailable for 24% of the cases diagnosed in Los Angeles County, for those cases where data are available, about 53% are born in the U.S. and 47% outside of the U.S. (Figure 6), mostly from Latin America.

RATES BY STAGE AT DIAGNOSIS

Only about one-third of colorectal cancers among AYAs are diagnosed at localized stage (30% for males and 31% for females), with nearly one-quarter diagnosed with distant disease (23% for males and 28% for females) (Figure 7).

TABLE 1.
AGE-ADJUSTED INCIDENCE RATE BY AGE FOR AYA CARCINOMA OF COLON AND RECTUM IN LOS ANGELES COUNTY, 1988-2011

	Males		Females	
Age Group	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
15-24	84	0.5 (0.4–0.5)	49	0.3 (0.2–0.4)
25-34	497	2.6 (2.4–2.8)	403	2.2 (2.0–2.4)
35-39	656	7.3 (6.7–7.8)	587	6.6 (6.0–7.1)
All Ages 15-39	**1,237**	**2.8 (2.7–3.0)**	**1,039**	**2.4 (2.3–2.6)**

TABLE 2. AGE-ADJUSTED INCIDENCE RATE BY AGE AND RACE/ETHNICITY FOR AYA CARCINOMA OF COLON AND RECTUM IN LOS ANGELES COUNTY, 1988-2011

MALES								
	All Ages 15-24		**All Ages 25-34**		**All Ages 35-39**		**All Ages 15-39**	
Race/Ethnicity	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
Latino White	39	0.4 (0.3-0.5)	213	2.4 (2.1-2.7)	214	5.8 (5.0-6.5)	466	2.4 (2.2-2.6)
Black	<20	—	53	3.2 (2.3-4.1)	78	9.5 (7.4-11.6)	140	3.6 (3.0-4.2)
Non-Latino White	21	0.4 (0.3-0.6)	169	2.7 (2.3-3.2)	268	8.4 (7.4-9.4)	458	3.1 (2.8-3.4)
Chinese	<20	—	<20	—	<20	—	32	2.2 (1.4-3.0)
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	23	2.0 (1.2-2.9)
Korean	<20	—	<20	—	<20	—	25	3.0 (1.8-4.2)
Vietnamese	<20	—	<20	—	<20	—	24	5.9 (3.5-8.2)
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—
FEMALES								
Latino White	<20	—	158	2.0 (1.7-2.3)	185	5.2 (4.4-5.9)	362	2.0 (1.8-2.2)
Black	<20	—	51	2.7 (1.9-3.4)	90	9.4 (7.5-11.3)	150	3.3 (2.8-3.9)
Non-Latino White	<20	—	125	2.2 (1.8-2.6)	206	7.0 (6.0-8.0)	342	2.5 (2.3-2.8)
Chinese	<20	—	<20	—	<20	—	35	2.1 (1.4-2.8)
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	27	2.0 (1.2-2.8)
Korean	<20	—	<20	—	22	10.7 (6.2-15.1)	34	3.6 (2.4-4.8)
Vietnamese	<20	—	<20	—	<20	—	22	5.3 (3.1-7.5)
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—

FIGURE 1. AGE-SPECIFIC RATE BY SEX FOR AYA CARCINOMA OF COLON AND RECTUM IN LOS ANGELES COUNTY, 1988-2011

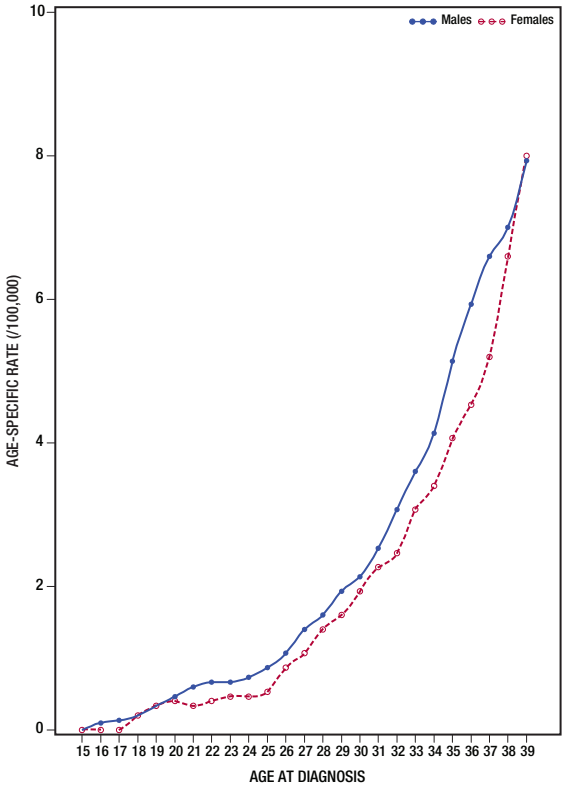


FIGURE 2. TREND IN AGE-ADJUSTED INCIDENCE RATE BY SEX FOR AYA CARCINOMA OF COLON AND RECTUM IN LOS ANGELES COUNTY, 1988-2011

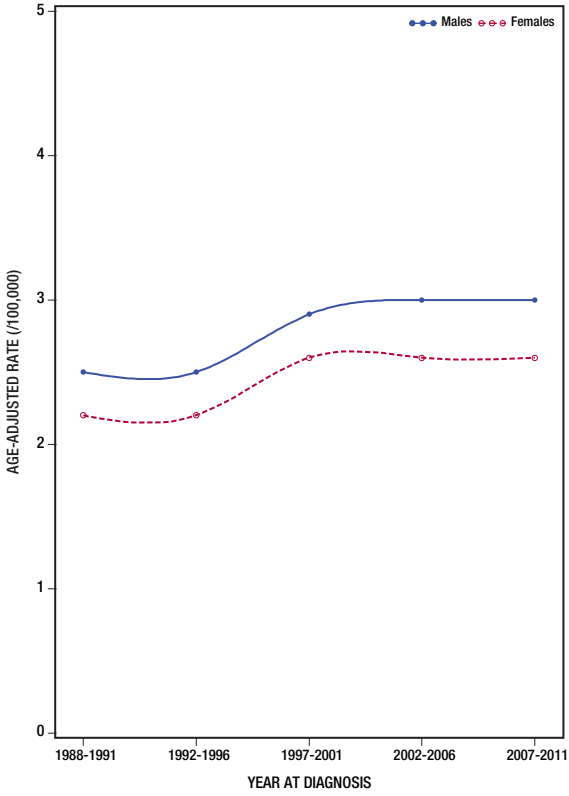


FIGURE 3. TREND IN AGE-SPECIFIC RATE BY SEX FOR AYA CARCINOMA OF COLON AND RECTUM IN LOS ANGELES COUNTY, 1988-2011

FIG 3(A): MALES

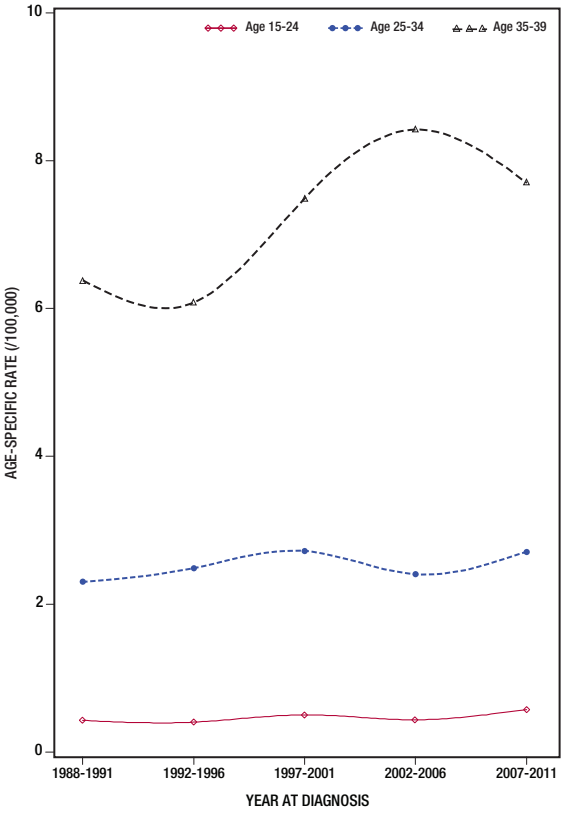


FIG 3(B): FEMALES

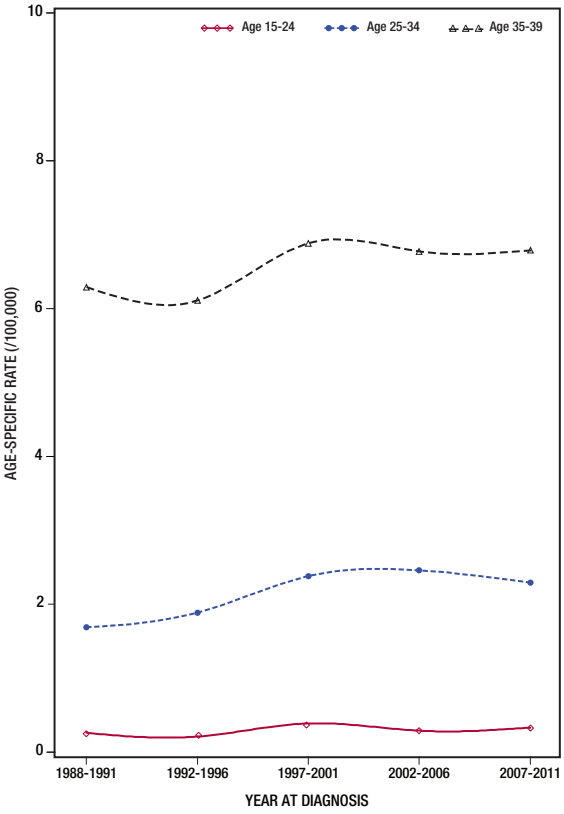


FIGURE 4. AGE-ADJUSTED INCIDENCE RATE BY RACE/ETHNICITY FOR AYA CARCINOMA OF COLON AND RECTUM IN LOS ANGELES COUNTY, 1988-2011

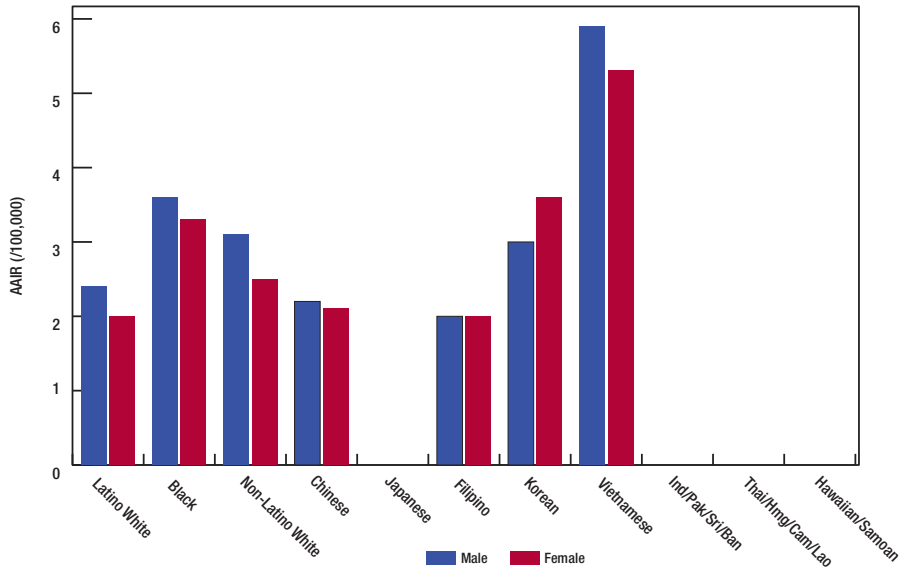


FIGURE 5. AGE-ADJUSTED INCIDENCE RATE BY SES BY RACE/ETHNICITY FOR AYA CARCINOMA OF COLON AND RECTUM IN LOS ANGELES COUNTY, 1988-2011

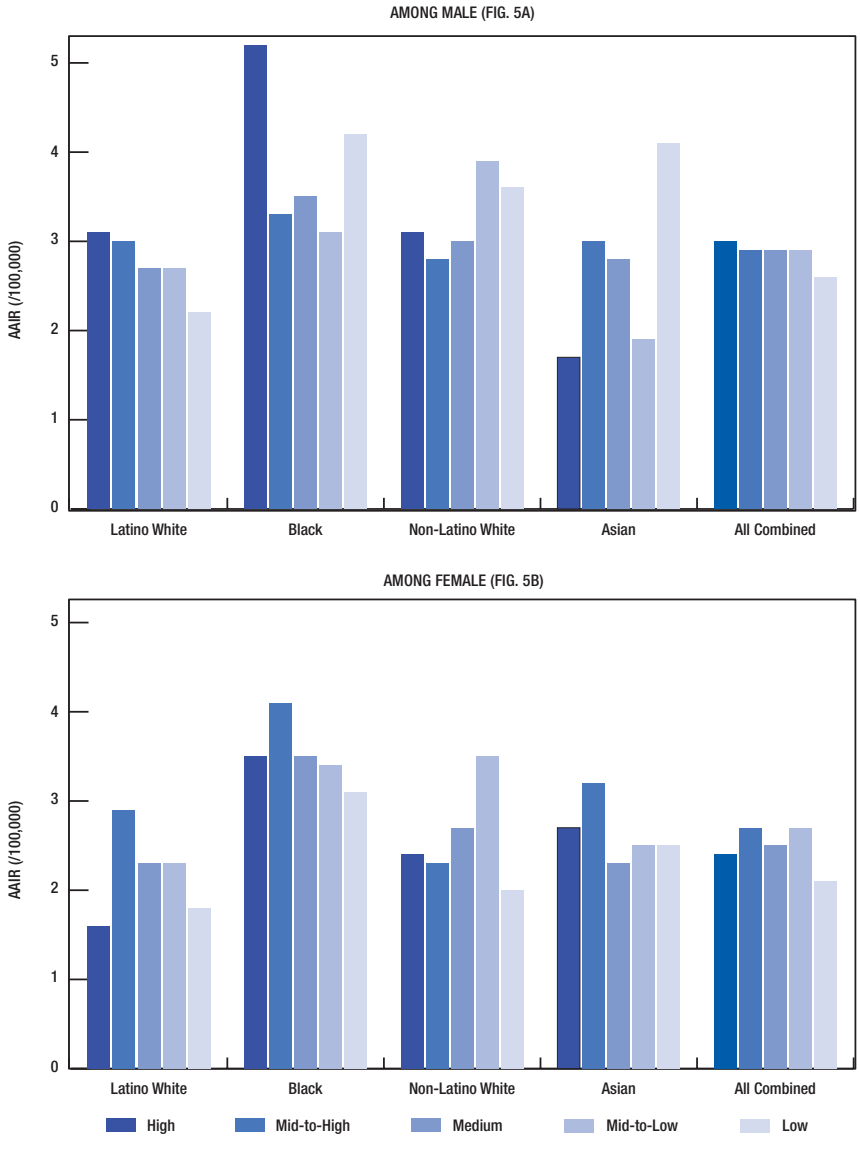
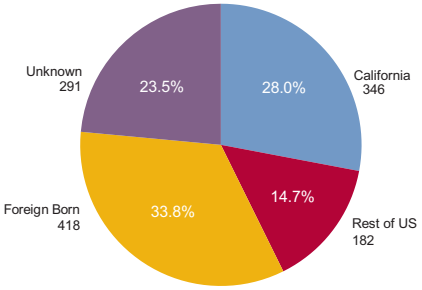
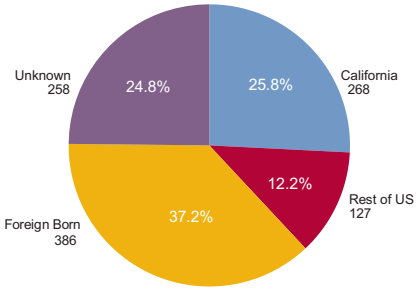


FIGURE 6. FREQUENCY DISTRIBUTION OF BIRTH PLACE FOR AYA CARCINOMA OF COLON AND RECTUM BY SEX IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 6A)

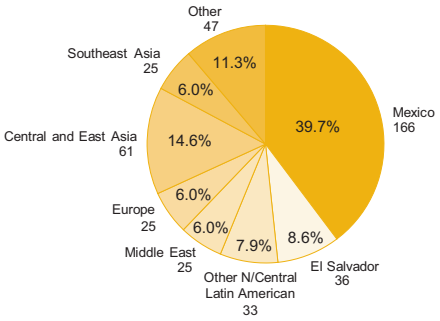


FEMALE (FIG. 6B)



AMONG FOREIGN BORN

MALE (FIG. 6C)



FEMALE (FIG. 6D)

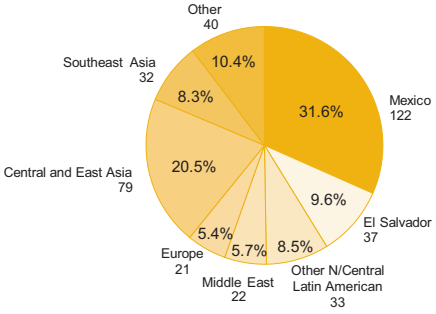
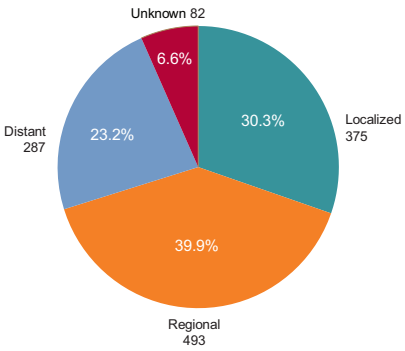
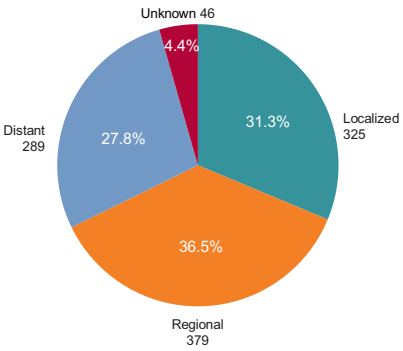


FIGURE 7. FREQUENCY DISTRIBUTION OF STAGE OF DISEASE BY SEX FOR AYA CARCINOMA OF COLON AND RECTUM IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 7A)



FEMALE (FIG. 7B)



LIP, ORAL CAVITY AND PHARYNX

Joseph Li

When grouped together, cancer of the lip, oral cavity (tongue and mouth), and pharynx (excluding the nasopharynx) represent the 6th most common cancer in the world. In the U.S., even though overall rates have been decreasing for the past three decades, rates in the young are increasing, particularly for tongue and tonsil cancer. This is a significant problem, as the five-year survival rate for these cancers is 62% in the U.S. In addition, the treatment itself may have a serious impact on a person's appearance and daily functioning (e.g. eating, drinking, or speaking), which puts many at risk for depression. However, the majority of lip, oral cavity, and pharyngeal cancers are preventable.

Tobacco, excessive alcohol use, and periodontal disease are well-known risk factors for cancer of the oral cavity and pharynx for both older individuals and AYAs. It is estimated that three-quarters of these cancers can be prevented by eradicating tobacco use and reducing alcohol consumption. In fact, the decreasing overall incidence in the U.S. has been attributed to declines in smoking and alcohol use. However, there is a growing population of young patients without these traditional risk factors. Studies of this subgroup have led some researchers to suspect that the human papillomavirus (HPV), especially HPV-16, may be an important risk factor for developing oral and pharyngeal cancer and may account for the rising incidence of tonsil and tongue cancer in young people. Oral HPV infection has been associated with increased number of lifetime sexual partners and certain sexual behaviors, such as oral-genital contact.

A diet rich in fruits and vegetables has been shown to reduce the risk for oral cancer and protection from UV light/sunlight has been shown to reduce the risk of lip cancer.

Among AYAs, oral cancer is more common in males than females. This is at least partially due to the increased indulgence in risky behaviors and exposure to sunlight as part of outdoor occupations by males. Higher incidence rates are also seen in patients who are older. Blacks and whites have the highest rates of oral cavity and pharyngeal cancer in the U.S. for AYAs.

RATES BY AGE AND SEX AND TIME TRENDS

In Los Angeles County from 1988-2011, approximately 37 AYAs are diagnosed with lip, oral cavity, or pharyngeal cancer each year (Table 1). The rates appear to be stable for females from 1988-2011 (Figure 2). Risk is greater for males than females aged 35-39, but this was not seen in the 15-24 or 25-34 age groups (Table 1). The rates increase with older age at a similar rate for both sexes up to the age of 34, after which males have a large increase in cancer incidence compared to females (Figure 1). Thus, although the overall rates for males remained slightly greater than that of females from 1988-2011 (Figure 2), this is attributable to the gender differences seen only in the 35-39 age group.

RATES BY RACE/ETHNICITY, SOCIOECONOMIC STATUS AND BIRTHPLACE

For both AYA males and females in Los Angeles County, the highest rates are in non-Latino whites and blacks (Table 2). Non-Latino white and black males have greater rates compared to their female counterparts.

There is no statistically significant association between incidence rates and SES. However, when all ethnicities were combined within each sex, the values trend toward higher SES being associated with higher incidence rates, which is in contrast to what is seen in adults ages 40 and above (Figure 5).

Birthplace information is available for approximately 75% of AYA cases in Los Angeles County. For these individuals, around 24% of males and 25% of females were born outside of the U.S (Figure 6). The majority of the foreign-born are from either Mexico or Central and East Asia (Figure 6). Of those born in the U.S., 67% were born in California (Figure 6).

RATES BY STAGE AT DIAGNOSIS

The oral cavity and parts of the pharynx are relatively accessible for examination. Despite this, from 1988 to 2011, only 50% of male and 60% of female AYAs in Los Angeles County have localized disease at diagnosis (Figure 7). Since the 5-year survival for all ages combined drops from 82% for localized disease to 59% for regional disease and 36% for distant disease, early detection is critical. The proportion of cases diagnosed at early stages decreases with increasing age for AYA and older adults (not shown). Importantly, though survival is better for younger patients compared to older patients with the same disease stage at presentation, it is not yet clear whether this is because of a difference in the character of their disease or because the young are healthier than their older counterparts.

TABLE 1.
AGE-ADJUSTED INCIDENCE RATE BY AGE FOR AYA
LIP, ORAL CAVITY AND PHARYNX IN LOS ANGELES COUNTY, 1988-2011

	Males		Females	
Age Group	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
15-24	45	0.2 (0.2–0.3)	57	0.3 (0.3–0.4)
25-34	184	1.0 (0.8–1.1)	183	1.0 (0.8–1.1)
35-39	262	2.9 (2.5–3.2)	148	1.7 (1.4–1.9)
All Ages 15-39	**491**	**1.1 (1.0–1.2)**	**388**	**0.9 (0.8–1.0)**

TABLE 2. AGE-ADJUSTED INCIDENCE RATE BY AGE AND RACE/ETHNICITY FOR AYA
LIP, ORAL CAVITY AND PHARYNX IN LOS ANGELES COUNTY, 1988-2011

MALES								
	All Ages 15-24		**All Ages 25-34**		**All Ages 35-39**		**All Ages 15-39**	
Race/Ethnicity	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
Latino White	<20	—	56	0.6 (0.5-0.8)	56	1.5 (1.1-1.9)	129	0.7 (0.5-0.8)
Black	<20	—	22	1.3 (0.8-1.9)	34	4.1 (2.7-5.5)	60	1.5 (1.2-1.9)
Non-Latino White	<20	—	82	1.3 (1.0-1.6)	134	4.2 (3.5-4.9)	230	1.6 (1.4-1.8)
Chinese	<20	—	<20	—	<20	—	<20	—
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	<20	—
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—
FEMALES								
Latino White	<20	—	62	0.8 (0.6-1.0)	38	1.1 (0.7-1.4)	118	0.6 (0.5-0.7)
Black	<20	—	21	1.1 (0.6-1.6)	27	2.8 (1.8-3.9)	56	1.2 (0.9-1.6)
Non-Latino White	<20	—	65	1.1 (0.9-1.4)	62	2.1 (1.6-2.6)	146	1.1 (0.9-1.3)
Chinese	<20	—	<20	—	<20	—	<20	—
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	<20	—
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—

FIGURE 1. AGE-SPECIFIC RATE BY SEX FOR AYA LIP, ORAL CAVITY AND PHARYNX IN LOS ANGELES COUNTY, 1988-2011

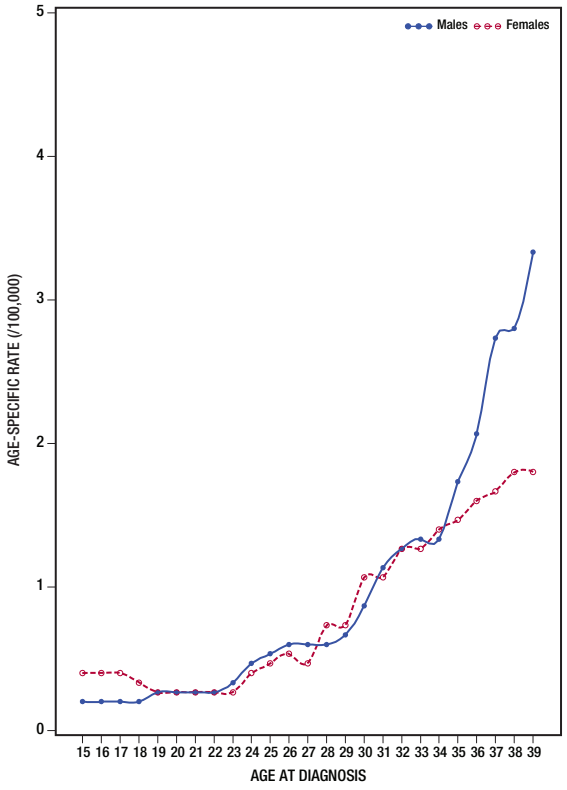


FIGURE 2. TREND IN AGE-ADJUSTED INCIDENCE RATE BY SEX FOR AYA LIP, ORAL CAVITY AND PHARYNX IN LOS ANGELES COUNTY, 1988-2011

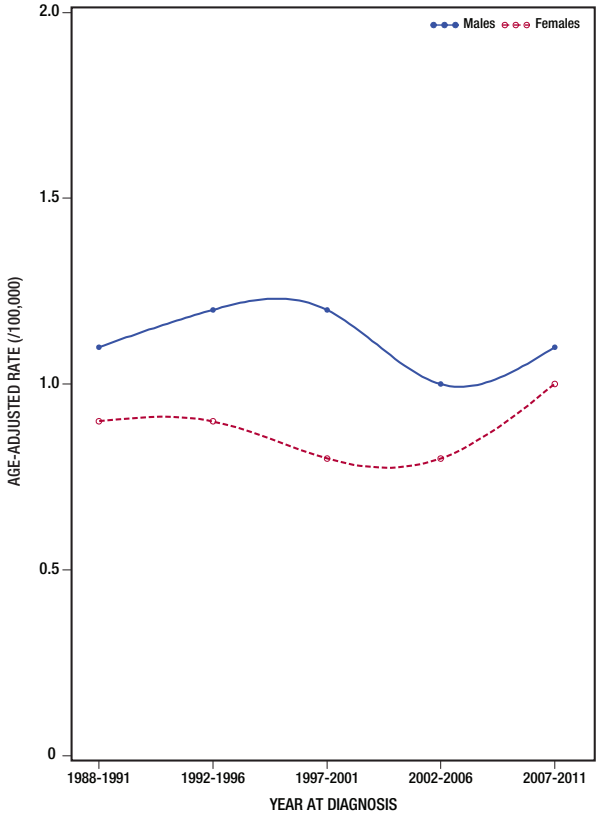


FIGURE 3. TREND IN AGE-SPECIFIC RATE BY SEX FOR AYA LIP, ORAL CAVITY AND PHARYNX IN LOS ANGELES COUNTY, 1988-2011

FIG 3(A): MALES

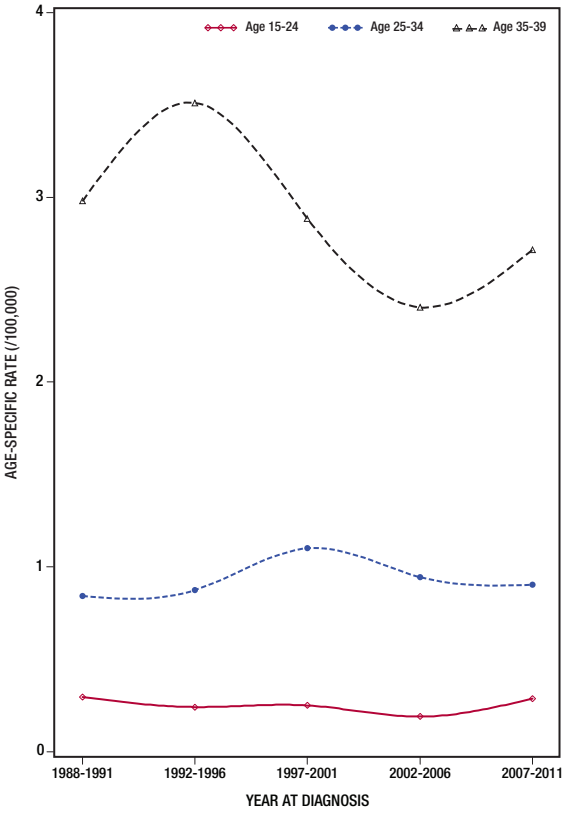


FIG 3(B): FEMALES

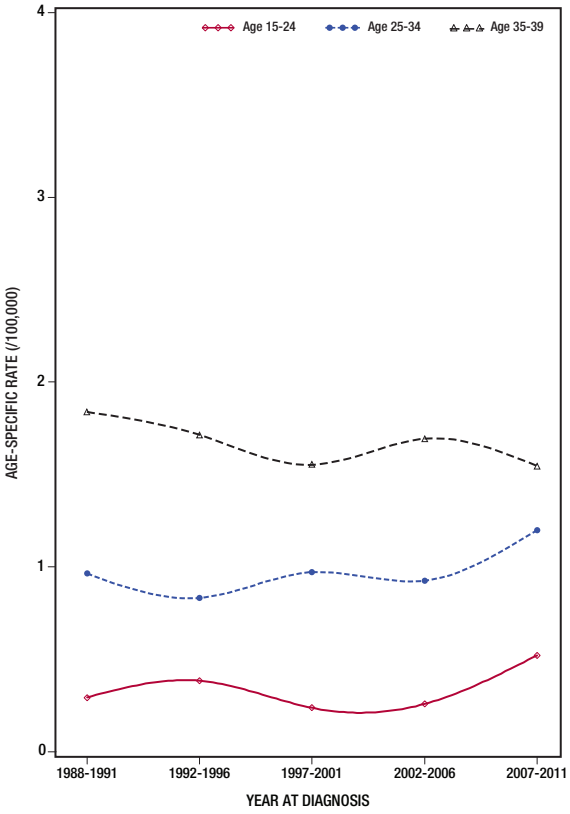


FIGURE 4. AGE-ADJUSTED INCIDENCE RATE BY RACE/ETHNICITY FOR AYA LIP, ORAL CAVITY AND PHARYNX IN LOS ANGELES COUNTY, 1988-2011

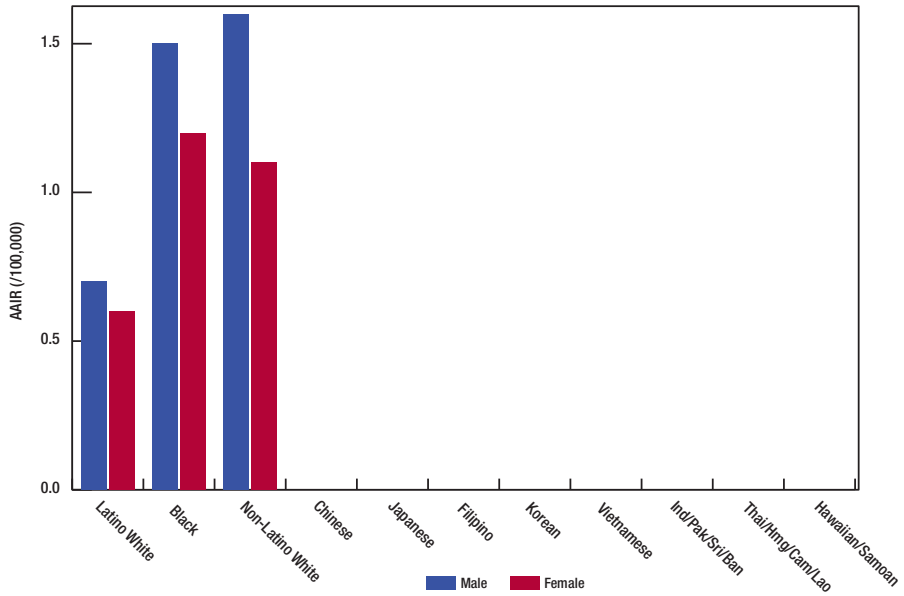
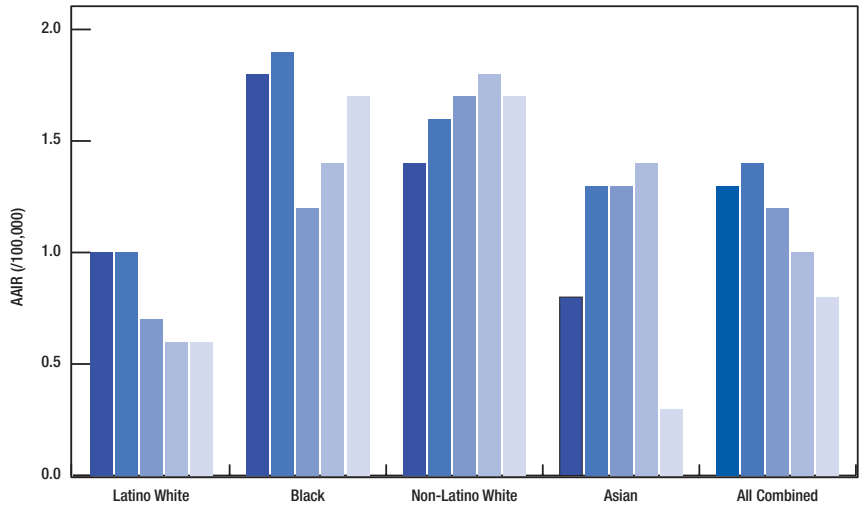


FIGURE 5. AGE-ADJUSTED INCIDENCE RATE BY SES BY RACE/ETHNICITY FOR AYA LIP, ORAL CAVITY AND PHARYNX IN LOS ANGELES COUNTY, 1988-2011

AMONG MALE (FIG. 5A)



AMONG FEMALE (FIG. 5B)

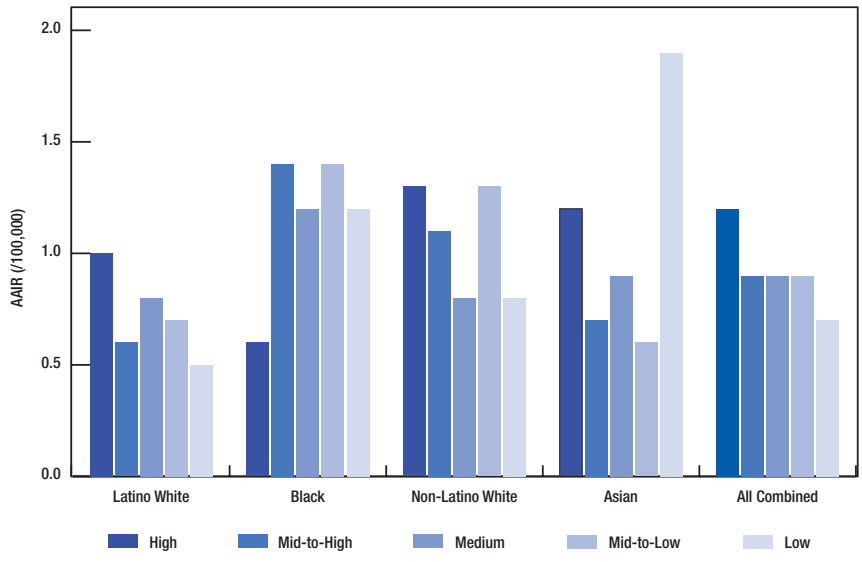
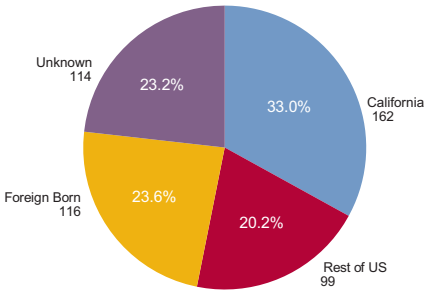
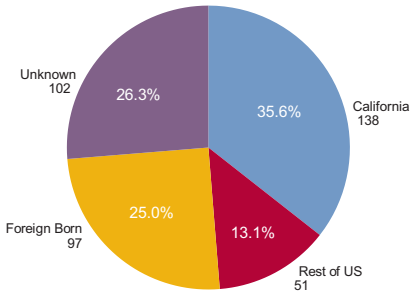


FIGURE 6. FREQUENCY DISTRIBUTION OF BIRTH PLACE FOR AYA LIP, ORAL CAVITY AND PHARYNX BY SEX IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 6A)

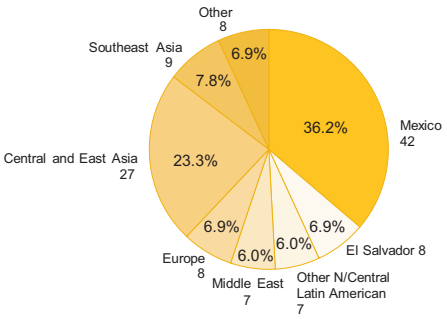


FEMALE (FIG. 6B)



AMONG FOREIGN BORN

MALE (FIG. 6C)



FEMALE (FIG. 6D)

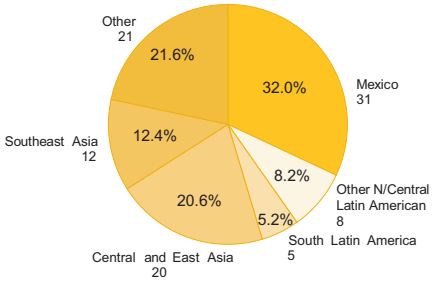
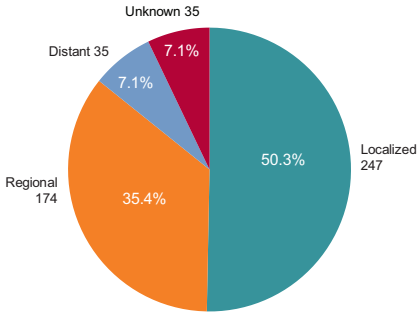
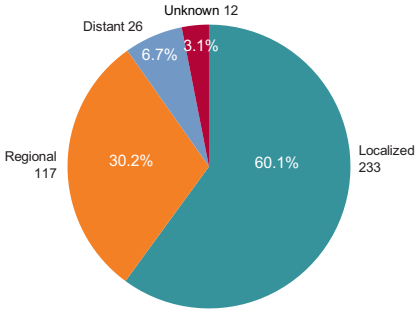


FIGURE 7. FREQUENCY DISTRIBUTION OF STAGE OF DISEASE BY SEX FOR AYA LIP, ORAL CAVITY AND PHARYNX IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 7A)



FEMALE (FIG. 7B)



KAPOSI'S SARCOMA

Ann Hamilton, PhD

The incidence of Kaposi's Sarcoma (KS) among the AYA population closely parallels the incidence of HIV/AIDS in this population, including higher incidence in the early years of the AIDS epidemic, followed by a steep decline after "highly active antiretroviral therapy" (HAART) was introduced in 1996. While "classic" KS occurred among the elderly prior to the AIDS epidemic, it was not until the onset of the AIDS epidemic that KS was seen in the AYA population. In addition, similar to the early years of the AIDS epidemic, the highest incidence was found among non-Latino white and black gay men from lower socioeconomic status (SES) areas. Since then it has been shown that another virus transmitted among gay men (KSHV) in combination with immunosuppression caused by HIV was related to the development of KS; KSHV alone was insufficient to cause the development of KS.

Risk factors for KS among AYAs are similar to risk factors for AIDS during the early years of the AIDS epidemic, i.e., being a gay male, drug user, from lower SES areas, and being non-Latino white or black. Survival, like incidence, has also been linked to improvements in treatment of HIV with HAART therapy.

RATES BY AGE AND SEX AND TIME TRENDS

Rates within the AYA age groups are higher among males and are practically non-existent among females (Table 1). Since very few cases occur among females between 1988-2011 (46 cases compared to 3,809 males), not enough information is available to identify trends among them. Rates among males increase with age, beginning in the early 20's and peak at age 36 (Figure 1). The important time periods to monitor changes in incidence can be divided into the 'pre-HAART' years (1992-1995), 'early-HAART years (1996-2000), and 'late-HAART' years (2001 and after). While there was a gradual decline of 17% in the male incidence rate between 1988-1991 and 1992-1995, the largest decline in rates took place between the 'pre-HAART' and 'early-HAART' time periods, declining by 70% among males (Figure 2). Between the 'early-HAART' and 'late-HAART' time periods, a further decline of 54% occurred and continued declining in 2006-2011. The decreases were similar for males in each age group (Figure 3).

RATES BY RACE/ETHNICITY, SOCIOECONOMIC STATUS AND BIRTHPLACE

Incidence rates are highest among non-Latino whites (Figure 4) with the highest rates among those from the lowest SES areas (Figure 5). Among blacks, who overall had the second highest incidence rate, there is little association with SES with rates slightly higher in the lowest SES group. Among Latinos, with the third highest incidence rate (Table 2), the highest rates are found among those from the highest SES areas. Asians have a very low incidence rate in all SES groups. Largely reflecting the origin of the Los Angeles population in general, men who are foreign born (representing about 20% of the all cases) are predominantly from Mexico, El Salvador or other North/Central Latin American countries (Figure 6).

RATES BY STAGE AT DIAGNOSIS

KS is a difficult disease to stage and nearly 50% of the cases for men are of unknown stage, 30% are considered distant disease, and 17% are localized (Figure 7). For the few cases among women, there is a similar distribution by stage.

TABLE 1.
AGE-ADJUSTED INCIDENCE RATE BY AGE FOR AYA KAPOSI'S SARCOMA IN LOS ANGELES COUNTY, 1988-2011

	Males		Females	
Age Group	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
15-24	112	0.6 (0.5–0.7)	<20	—
25-34	2,203	11.4 (10.9–11.9)	27	0.1 (0.1–0.2)
35-39	1,494	16.5 (15.7–17.4)	<20	—
All Ages 15-39	**3,809**	**8.3 (8.1–8.6)**	**46**	**0.1 (0.1–0.1)**

TABLE 2. AGE-ADJUSTED INCIDENCE RATE BY AGE AND RACE/ETHNICITY FOR AYA KAPOSI'S SARCOMA IN LOS ANGELES COUNTY, 1988-2011

MALES								
	All Ages 15-24		**All Ages 25-34**		**All Ages 35-39**		**All Ages 15-39**	
Race/Ethnicity	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
Latino White	53	0.5 (0.4-0.7)	776	8.7 (8.1-9.4)	429	11.6 (10.5-12.7)	1,258	6.2 (5.8-6.5)
Black	<20	—	286	17.2 (15.2-19.2)	173	21.1 (17.9-24.2)	478	11.8 (10.7-12.8)
Non-Latino White	35	0.7 (0.5-0.9)	1,027	16.7 (15.7-17.7)	790	24.7 (23.0-26.4)	1,852	12.3 (11.7-12.8)
Chinese	<20	—	<20	—	<20	—	<20	—
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	30	2.6 (1.6-3.5)
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—
FEMALES								
Latino White	<20	—	<20	—	<20	—	<20	—
Black	<20	—	<20	—	<20	—	<20	—
Non-Latino White	<20	—	<20	—	<20	—	<20	—
Chinese	<20	—	<20	—	<20	—	<20	—
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	<20	—
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—

FIGURE 1. AGE-SPECIFIC RATE BY SEX FOR AYA KAPOSI'S SARCOMA IN LOS ANGELES COUNTY, 1988-2011

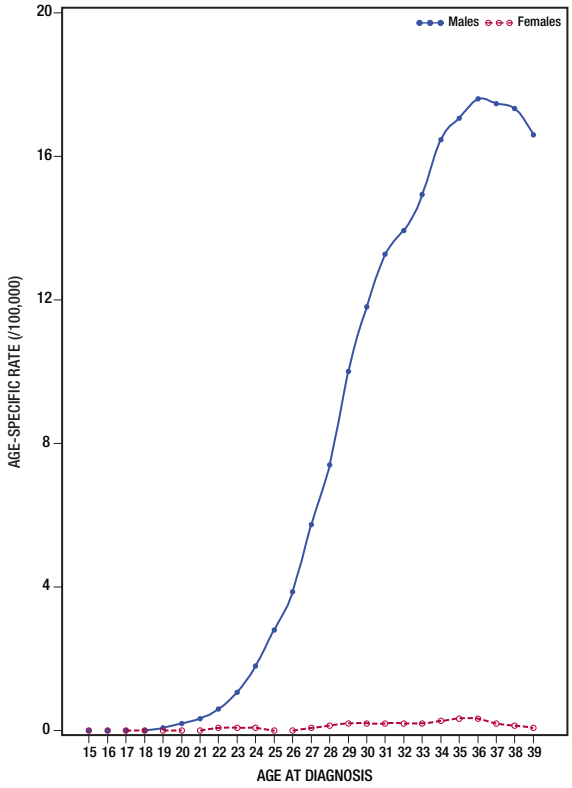


FIGURE 2. TREND IN AGE-ADJUSTED INCIDENCE RATE BY SEX FOR AYA KAPOSI'S SARCOMA IN LOS ANGELES COUNTY, 1988-2011

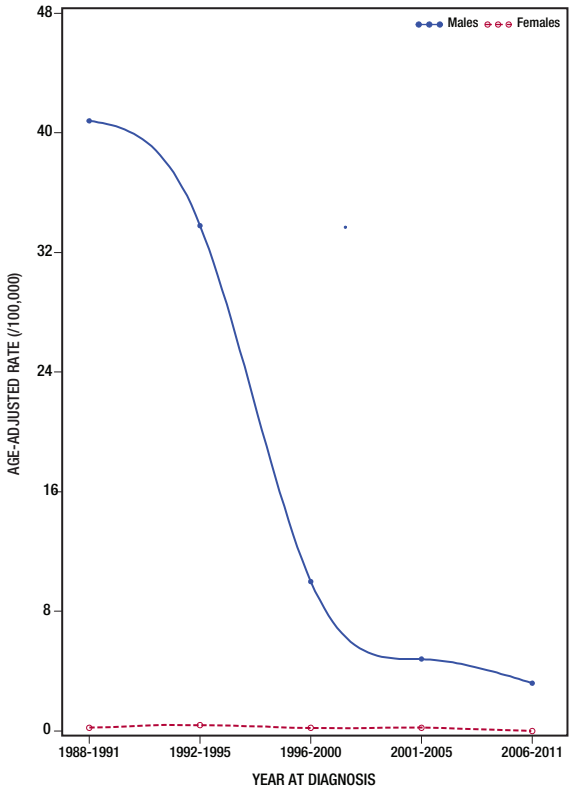


FIGURE 3. TREND IN AGE-SPECIFIC RATE BY SEX FOR AYA KAPOSI'S SARCOMA IN LOS ANGELES COUNTY, 1988-2011

FIG 3(A): MALES

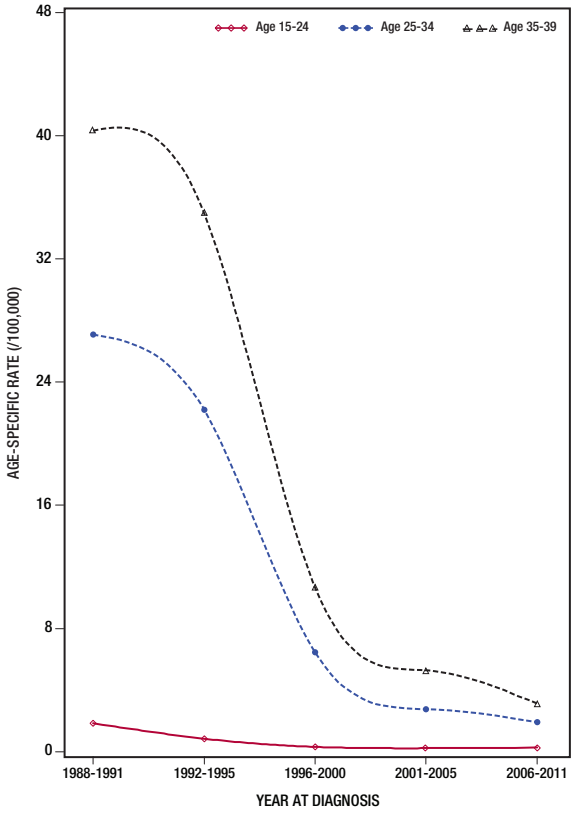


FIG 3(B): FEMALES

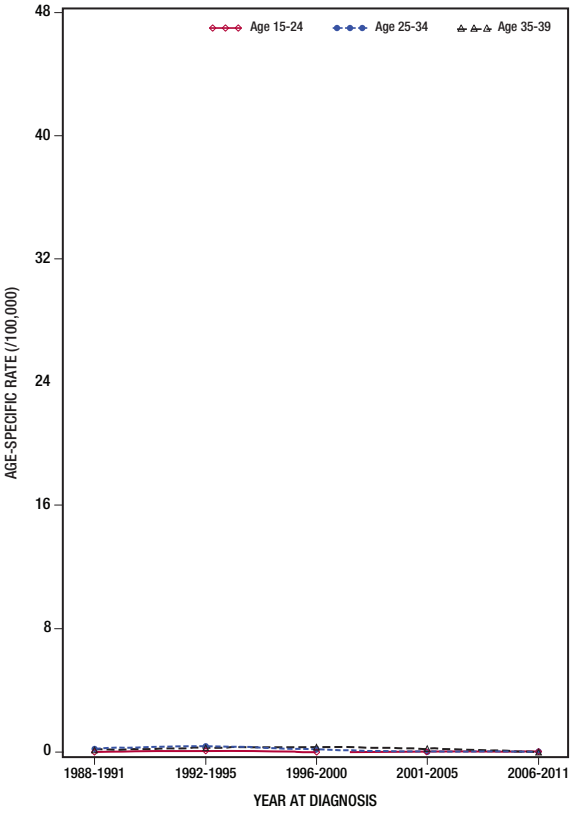


FIGURE 4. AGE-ADJUSTED INCIDENCE RATE BY RACE/ETHNICITY FOR AYA KAPOSI'S SARCOMA IN LOS ANGELES COUNTY, 1988-2011

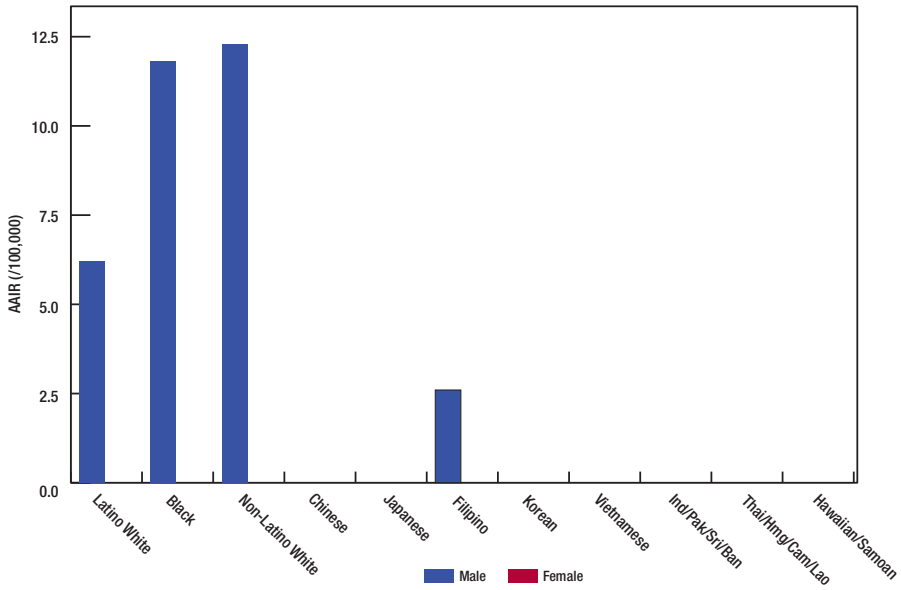


FIGURE 5. AGE-ADJUSTED INCIDENCE RATE BY SES BY RACE/ETHNICITY FOR AYA KAPOSI'S SARCOMA IN LOS ANGELES COUNTY, 1988-2011

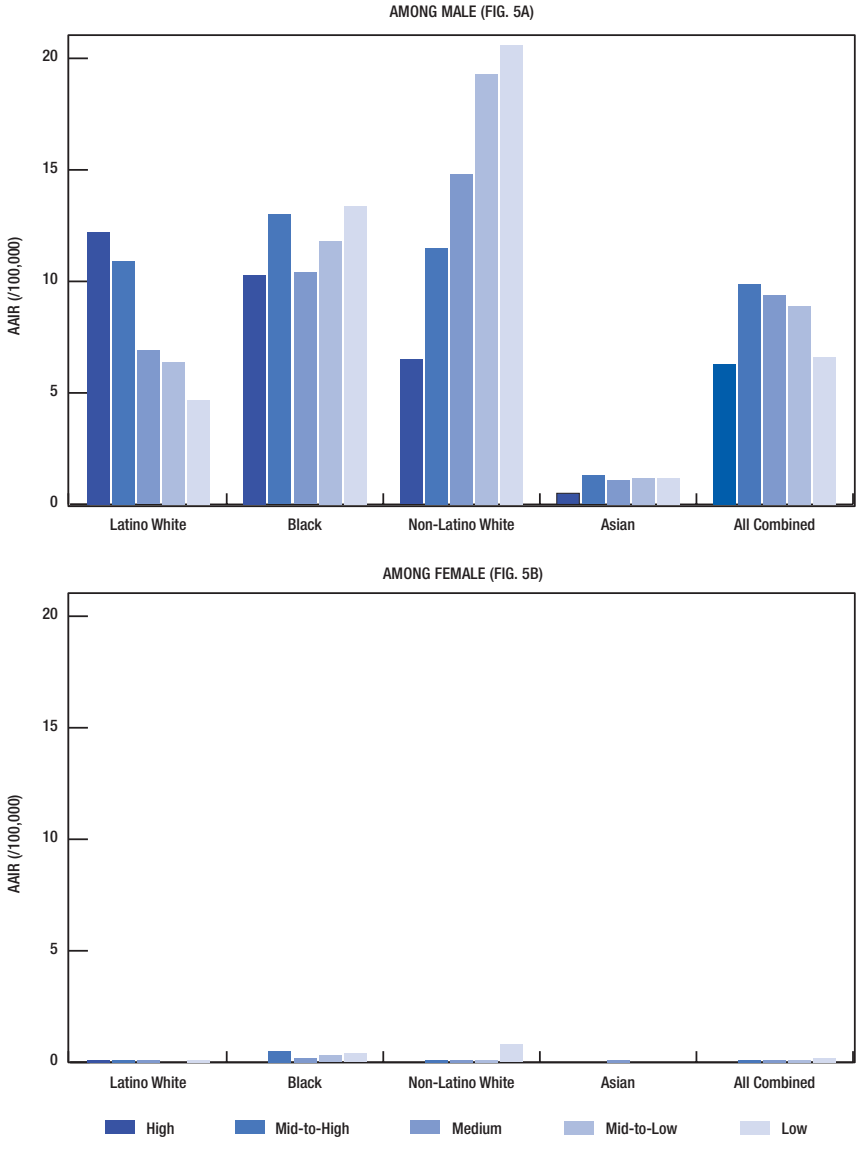
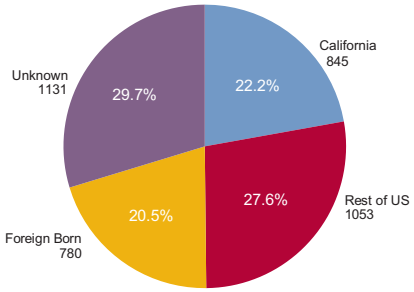
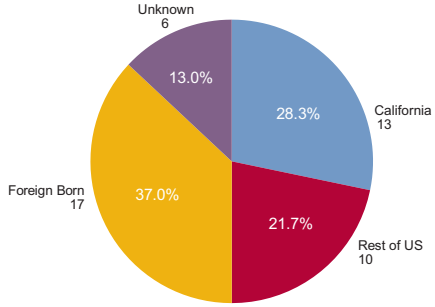


FIGURE 6. FREQUENCY DISTRIBUTION OF BIRTH PLACE FOR AYA KAPOSI'S SARCOMA BY SEX IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 6A)

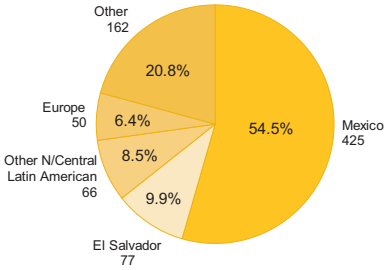


FEMALE (FIG. 6B)



AMONG FOREIGN BORN

MALE (FIG. 6C)



FEMALE (FIG. 6D)

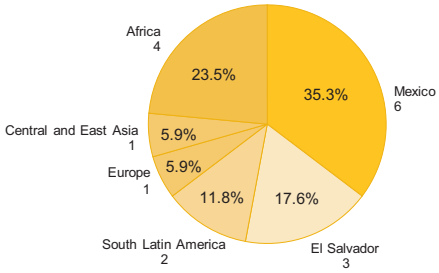
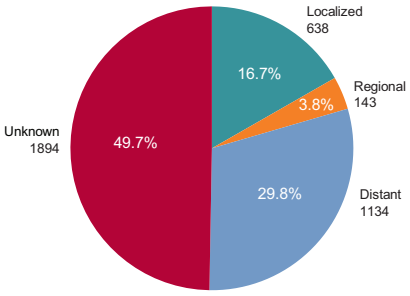
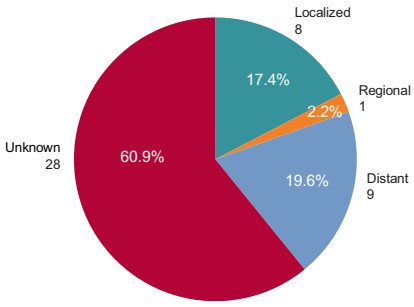


FIGURE 7. FREQUENCY DISTRIBUTION OF STAGE OF DISEASE BY SEX FOR AYA KAPOSI'S SARCOMA IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 7A)



FEMALE (FIG. 7B)



LEUKEMIA

Chelsea L. Collins, MD, MS and David R. Freyer, DO, MS

Leukemia is a cancer of the white blood cells of the immune system. Leukemia can be acute or chronic. The acute form is more common in younger patients and the chronic form is more common in older patients. There are two main types of acute leukemia: acute lymphoblastic leukemia (ALL) and acute myeloid leukemia (AML). Although acute leukemia is the most common cancer in children under age 15, it is the 10th most common cancer in AYAs.

Most cases of acute leukemia are not associated with any known risk factors. For unknown reasons, ALL occurs more commonly in males. People previously exposed to radiation therapy or certain types of chemotherapy (most commonly alkylating agents or topoisomerase II inhibitors) are at increased risk for developing secondary forms of acute leukemia, usually AML. People with certain inherited conditions, such as Down syndrome and neurofibromatosis type I, are also at increased risk for developing acute leukemia.

Survival for both AML and ALL has improved over the last several decades. Historically, survival in ALL has been significantly lower among AYAs compared to younger children. The reasons for this are not completely known, but research indicates that AYAs tend to have types of ALL that are more resistant to treatment. Research also suggests that AYAs with ALL are more likely to survive if they are treated using a chemotherapy plan based upon the highly successful approaches used in younger children.

RATES BY AGE, SEX AND TIME TRENDS

The incidence of ALL peaks in early childhood (under age 5), decreases in the AYA age group, and then steadily increases beyond age 40. Among AYAs in Los Angeles County, the incidence of ALL is highest in patients age 15-24 and is twice as common among males as it is among females (Table 1, pg. 95 and Figure 1, pg. 96). Over the past decade, there has been a slight increase in the rate that appears to be largely due to an increase in males age 15-24 (Figures 2-3, pg. 96).

The incidence of AML has a slight peak in early childhood and then steadily increases with age (Figure 1, pg. 100). For AYAs in Los Angeles County, males and females are equally affected, with slight excess among males beginning at age 35 (Table 1, pg. 99 and Figure 1, pg. 100). During the study period of 1988-2011, there is no clear change in the incidence rates by either age or gender (Figures 2-3, pg. 100).

RATES BY RACE/ETHNICITY, SOCIOECONOMIC STATUS AND BIRTHPLACE

Differences based on race/ethnicity exist for ALL in the AYA age range, especially among males. In Los Angeles County, the rate among Latino white males is approximately twice that for non-Latino white males, and four times that among black males (Table 2, pg. 95 and Figure 4, pg. 97). For females, the rate among Latina whites is approximately twice that seen in both non-Latina white and black females. Incidence also appears to increase with lower SES (Figure 5, pg. 97). In contrast, for AML there is no clear difference in incidence by race/ethnicity or SES (Table 2, pg. 99 and Figure 5, pg. 101).

Reflective of the general population of Los Angeles County, there are approximately equal proportions of foreign born and U.S. born residents diagnosed with acute leukemia (ALL and AML Figure 6).

RATES BY STAGE AT DIAGNOSIS

Since acute leukemia is a cancer of the blood, it is distantly spread in all patients at diagnosis (ALL and AML Figure 7).

TABLE 1.
AGE-ADJUSTED INCIDENCE RATE BY AGE FOR AYA ACUTE LYMPHOID LEUKEMIA IN LOS ANGELES COUNTY, 1988-2011

	Males		Females	
Age Group	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
15-24	372	2.1 (1.9–2.4)	167	1.0 (0.9–1.2)
25-34	172	0.9 (0.7–1.0)	110	0.6 (0.5–0.7)
35-39	88	1.0 (0.8–1.2)	41	0.5 (0.3–0.6)
All Ages 15-39	**632**	**1.4 (1.3–1.5)**	**318**	**0.7 (0.6–0.8)**

TABLE 2. AGE-ADJUSTED INCIDENCE RATE BY AGE AND RACE/ETHNICITY FOR AYA ACUTE LYMPHOID LEUKEMIA IN LOS ANGELES COUNTY, 1988-2011

MALES								
	All Ages 15-24		**All Ages 25-34**		**All Ages 35-39**		**All Ages 15-39**	
Race/Ethnicity	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
Latino White	270	2.9 (2.6-3.3)	113	1.3 (1.0-1.5)	59	1.6 (1.2-2.0)	442	2.0 (1.8-2.2)
Black	<20	—	<20	—	<20	—	22	0.5 (0.3-0.7)
Non-Latino White	68	1.7 (1.3-2.1)	43	0.7 (0.5-0.9)	20	0.6 (0.4-0.9)	131	1.1 (0.9-1.2)
Chinese	<20	—	<20	—	<20	—	<20	—
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	<20	—
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—
FEMALES								
Latino White	119	1.5 (1.2-1.7)	72	0.9 (0.7-1.1)	26	0.7 (0.4-1.0)	217	1.1 (0.9-1.2)
Black	<20	—	<20	—	<20	—	23	0.5 (0.3-0.7)
Non-Latino White	23	0.6 (0.3-0.8)	23	0.4 (0.2-0.6)	<20	—	55	0.4 (0.3-0.6)
Chinese	<20	—	<20	—	<20	—	<20	—
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	<20	—
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—

FIGURE 1. AGE-SPECIFIC RATE BY SEX FOR AYA ACUTE LYMPHOID LEUKEMIA IN LOS ANGELES COUNTY, 1988-2011

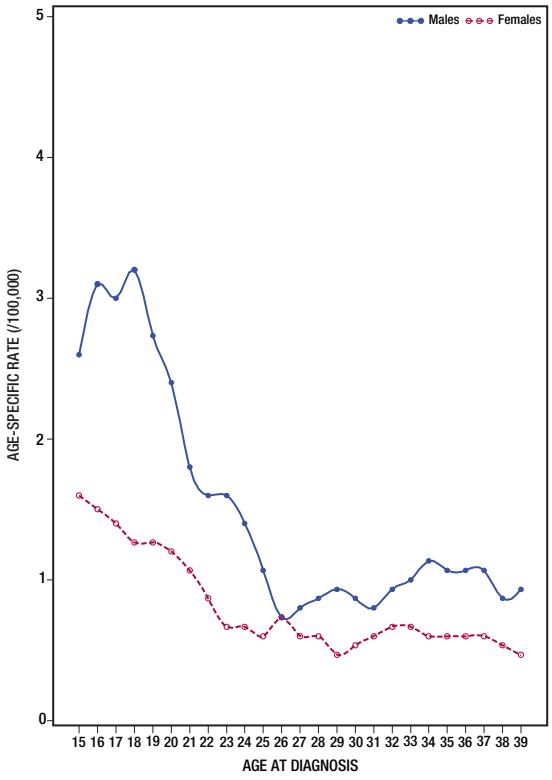


FIGURE 2. TREND IN AGE-ADJUSTED INCIDENCE RATE BY SEX FOR AYA ACUTE LYMPHOID LEUKEMIA IN LOS ANGELES COUNTY, 1988-2011

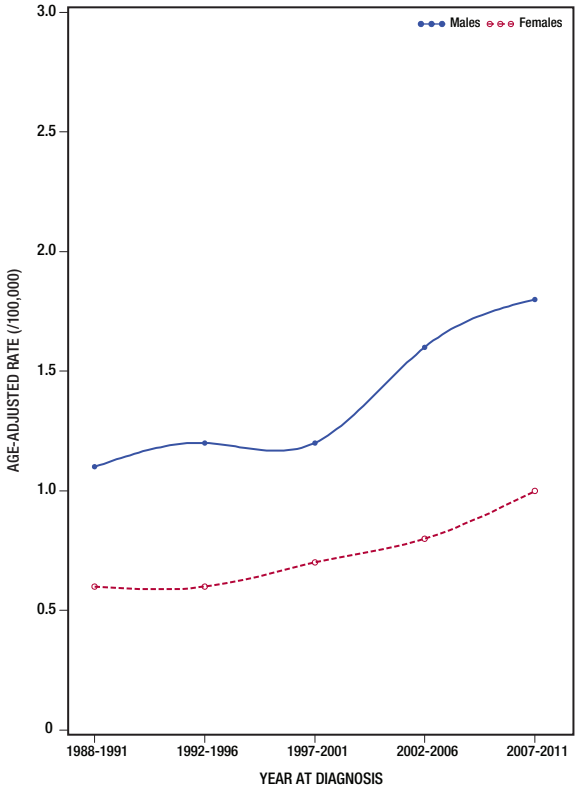


FIGURE 3. TREND IN AGE-SPECIFIC RATE BY SEX FOR AYA ACUTE LYMPHOID LEUKEMIA IN LOS ANGELES COUNTY, 1988-2011

FIG 3(A): MALES

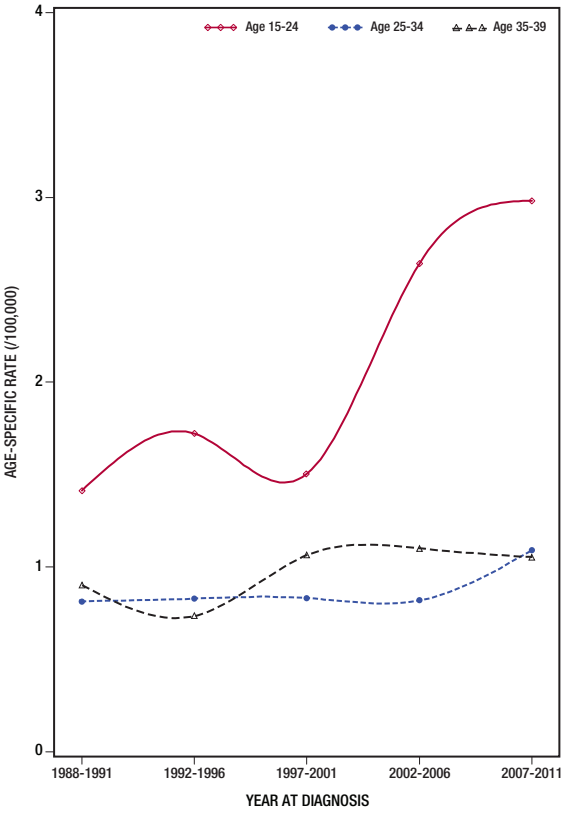


FIG 3(B): FEMALES

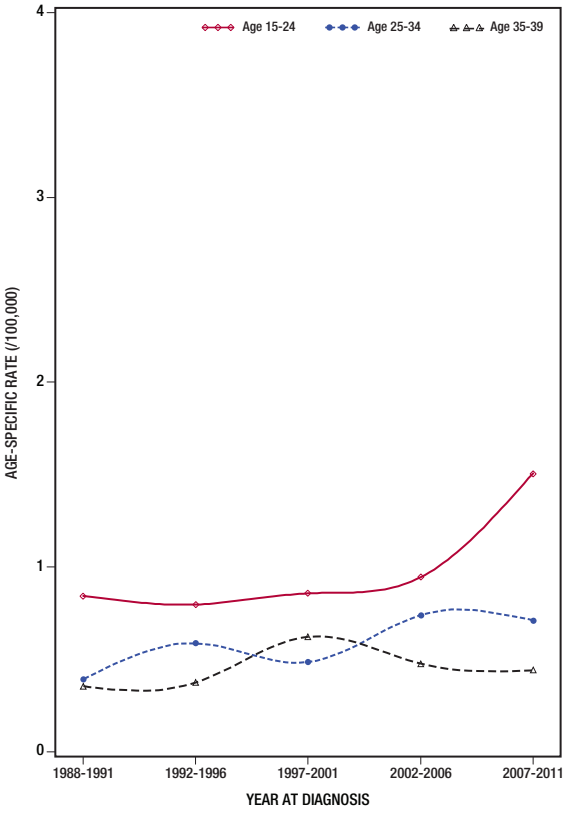


FIGURE 4. AGE-ADJUSTED INCIDENCE RATE BY RACE/ETHNICITY FOR AYA ACUTE LYMPHOID LEUKEMIA IN LOS ANGELES COUNTY, 1988-2011

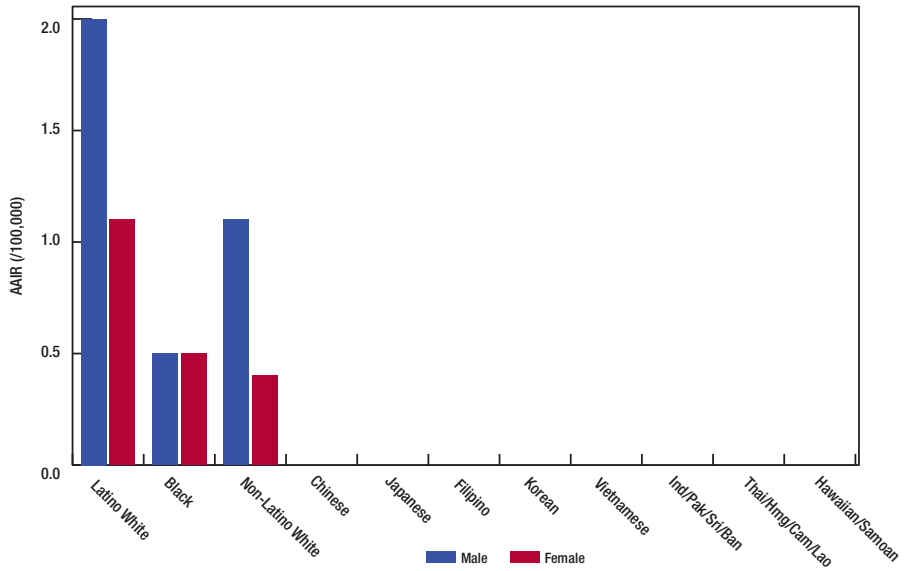
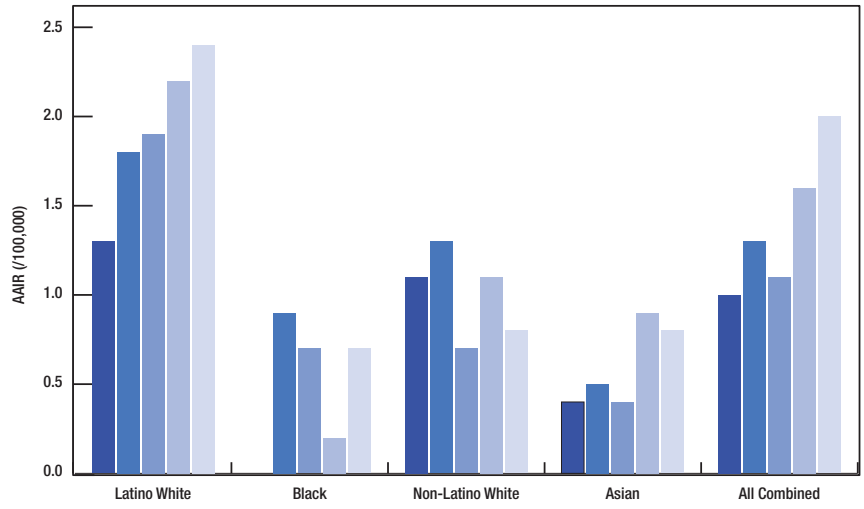


FIGURE 5. AGE-ADJUSTED INCIDENCE RATE BY SES BY RACE/ETHNICITY FOR AYA ACUTE LYMPHOID LEUKEMIA IN LOS ANGELES COUNTY, 1988-2011

AMONG MALE (FIG. 5A)



AMONG FEMALE (FIG. 5B)

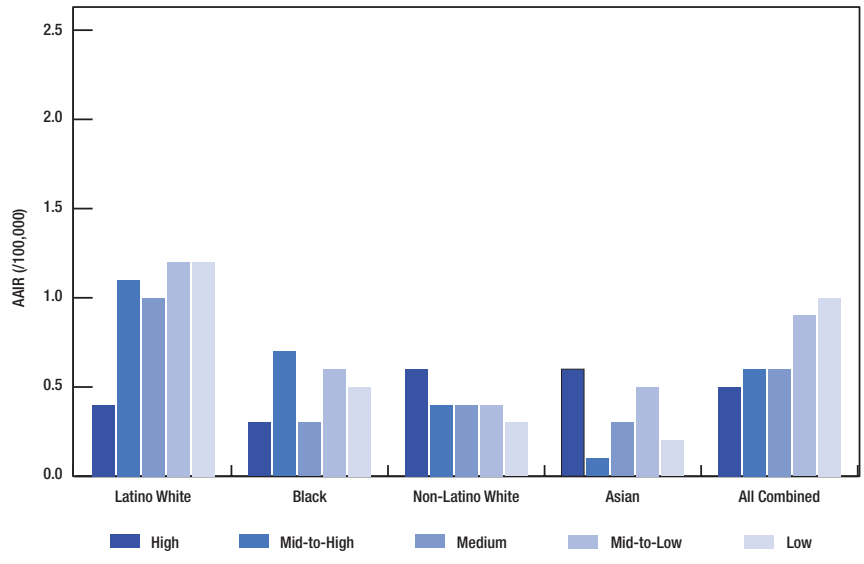
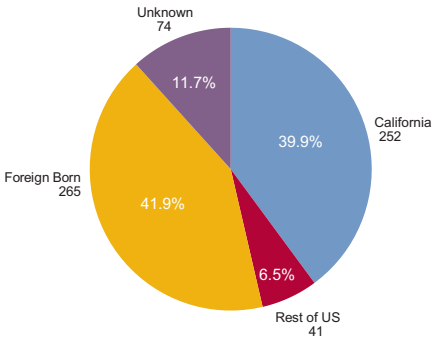
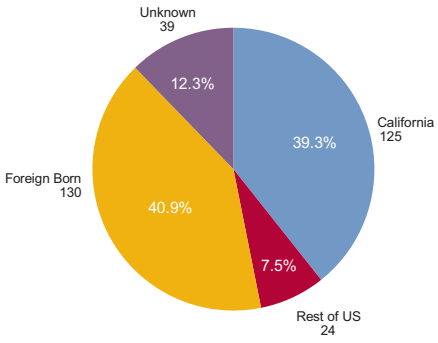


FIGURE 6. FREQUENCY DISTRIBUTION OF BIRTH PLACE FOR AYA ACUTE LYMPHOID LEUKEMIA BY SEX IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 6A)

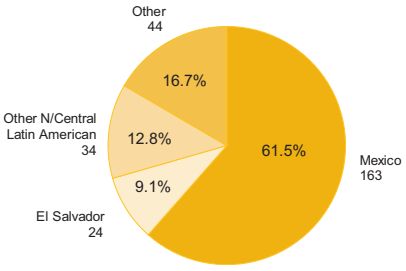


FEMALE (FIG. 6B)



AMONG FOREIGN BORN

MALE (FIG. 6C)



FEMALE (FIG. 6D)

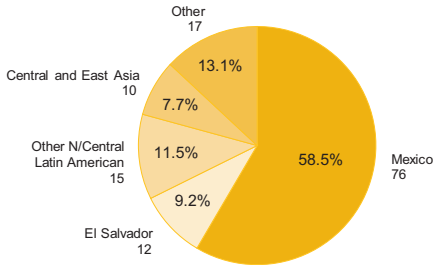
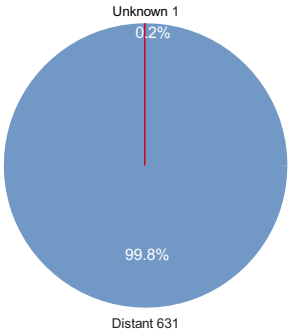


FIGURE 7. DISTRIBUTION OF STAGE OF DISEASE BY SEX FOR AYA ACUTE LYMPHOID LEUKEMIA IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 7A)



FEMALE (FIG. 7B)

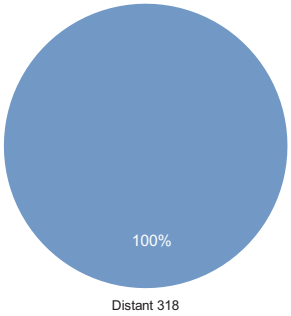


TABLE 1.
AGE-ADJUSTED INCIDENCE RATE BY AGE FOR AYA ACUTE MYELOID LEUKEMIA IN LOS ANGELES COUNTY, 1988-2011

	Males		Females	
Age Group	N	AAIR (95%CI)	N	AAIR (95%CI)
15-24	180	1.0 (0.9–1.1)	156	0.9 (0.8–1.1)
25-34	232	1.2 (1.0–1.3)	224	1.2 (1.0–1.4)
35-39	144	1.6 (1.3–1.9)	103	1.2 (0.9–1.4)
All Ages 15-39	**556**	**1.2 (1.1–1.3)**	**483**	**1.1 (1.0–1.2)**

TABLE 2. AGE-ADJUSTED INCIDENCE RATE BY AGE AND RACE/ETHNICITY FOR AYA ACUTE MYELOID LEUKEMIA IN LOS ANGELES COUNTY, 1988-2011

MALES								
	All Ages 15-24		All Ages 25-34		All Ages 35-39		All Ages 15-39	
Race/Ethnicity	N	AAIR (95%CI)	N	AAIR (95%CI)	N	AAIR (95%CI)	N	AAIR (95%CI)
Latino White	115	1.2 (1.0-1.4)	114	1.3 (1.0-1.5)	55	1.5 (1.1-1.9)	284	1.3 (1.1-1.4)
Black	<20	—	<20	—	<20	—	34	0.8 (0.5-1.1)
Non-Latino White	43	1.0 (0.7-1.3)	69	1.1 (0.9-1.4)	55	1.7 (1.3-2.2)	167	1.2 (1.0-1.4)
Chinese	<20	—	<20	—	<20	—	21	1.4 (0.8-2.0)
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	<20	—
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—
FEMALES								
Latino White	82	1.0 (0.8-1.2)	108	1.3 (1.1-1.6)	46	1.3 (0.9-1.7)	236	1.2 (1.0-1.3)
Black	<20	—	<20	—	<20	—	38	0.8 (0.6-1.1)
Non-Latino White	41	1.0 (0.7-1.3)	62	1.1 (0.8-1.4)	30	1.0 (0.7-1.4)	133	1.0 (0.9-1.2)
Chinese	<20	—	<20	—	<20	—	<20	—
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	<20	—
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—

FIGURE 1. AGE-SPECIFIC RATE BY SEX FOR AYA ACUTE MYELOID LEUKEMIA IN LOS ANGELES COUNTY, 1988-2011

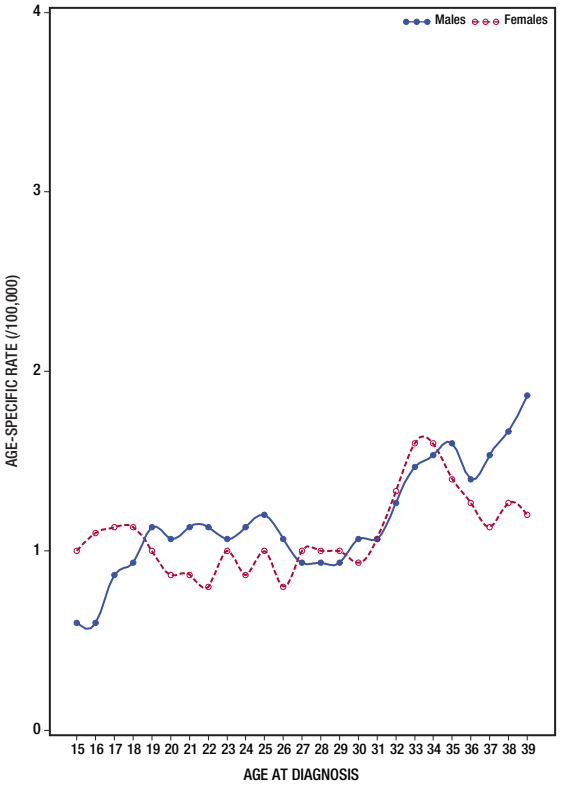


FIGURE 2. TREND IN AGE-ADJUSTED INCIDENCE RATE BY SEX FOR AYA ACUTE MYELOID LEUKEMIA IN LOS ANGELES COUNTY, 1988-2011

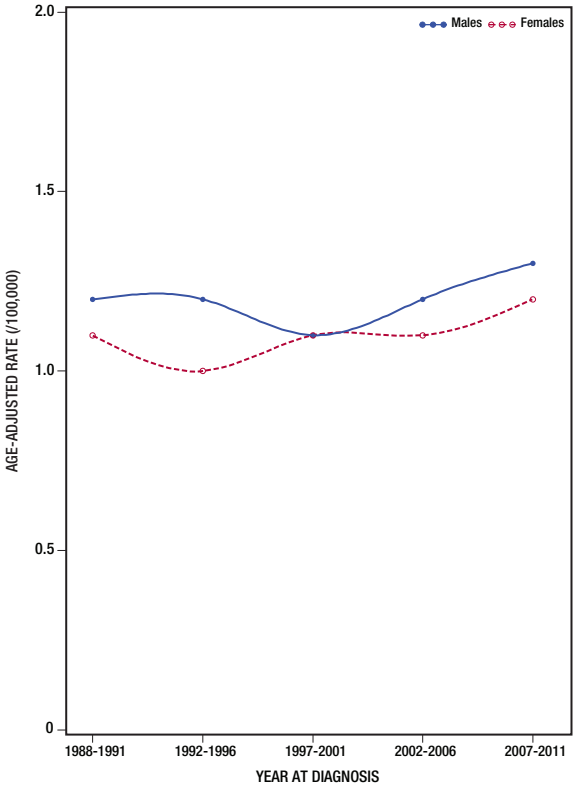


FIGURE 3. TREND IN AGE-SPECIFIC RATE BY SEX FOR AYA ACUTE MYELOID LEUKEMIA IN LOS ANGELES COUNTY, 1988-2011

FIG 3(A): MALES

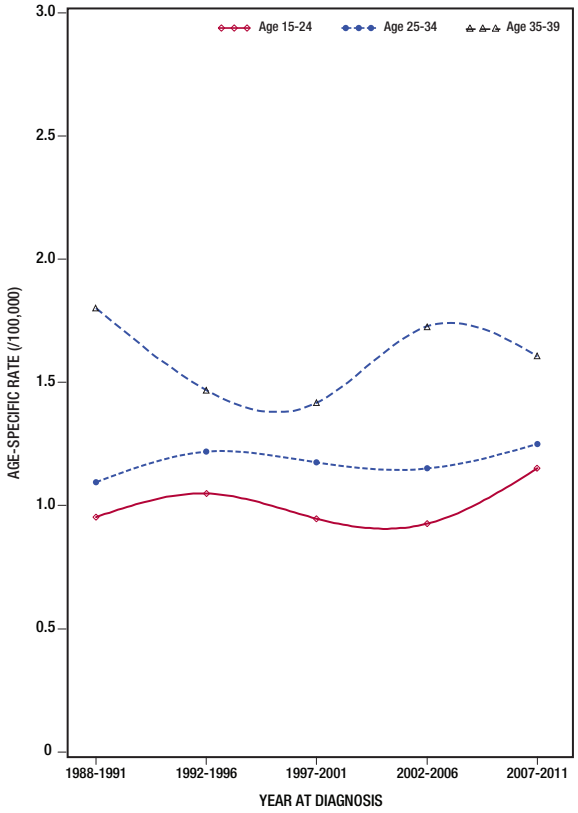


FIG 3(B): FEMALES

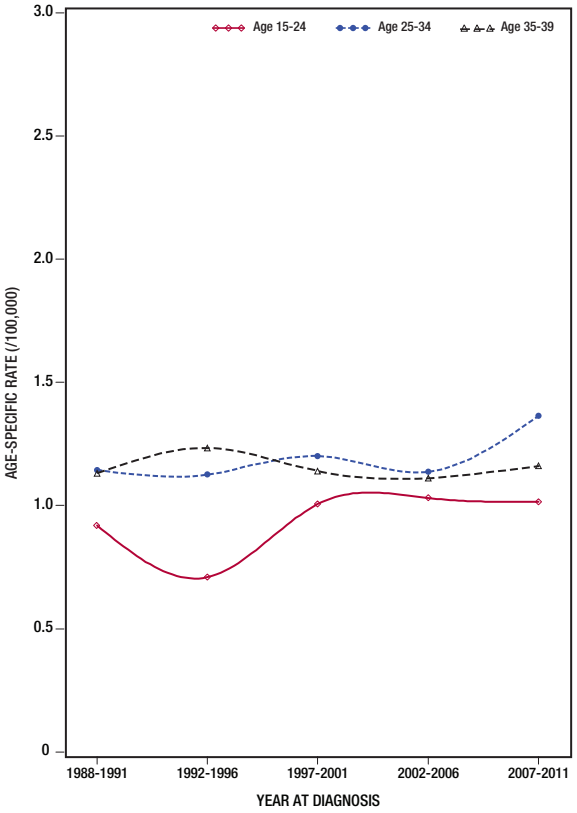


FIGURE 4. AGE-ADJUSTED INCIDENCE RATE BY RACE/ETHNICITY FOR AYA ACUTE MYELOID LEUKEMIA IN LOS ANGELES COUNTY, 1988-2011

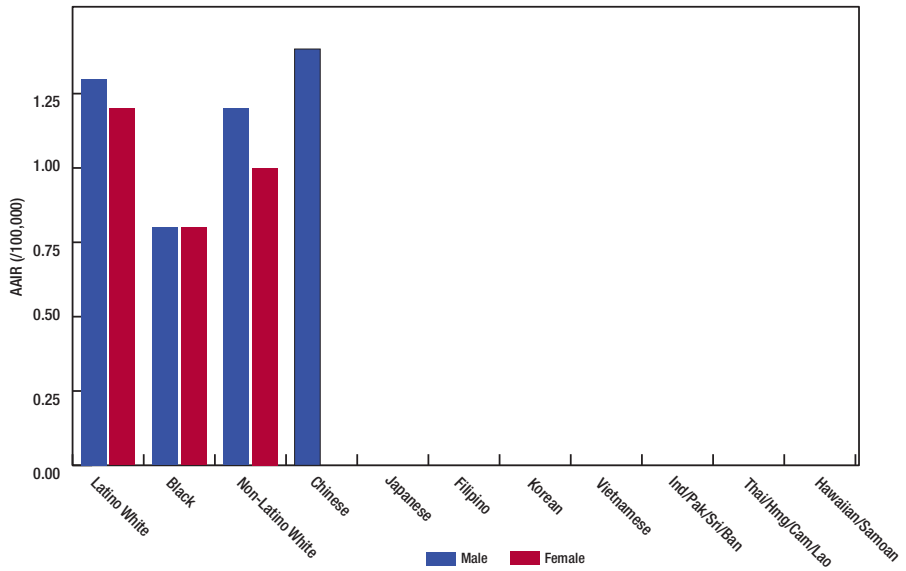


FIGURE 5. AGE-ADJUSTED INCIDENCE RATE BY SES BY RACE/ETHNICITY FOR AYA ACUTE MYELOID LEUKEMIA IN LOS ANGELES COUNTY, 1988-2011

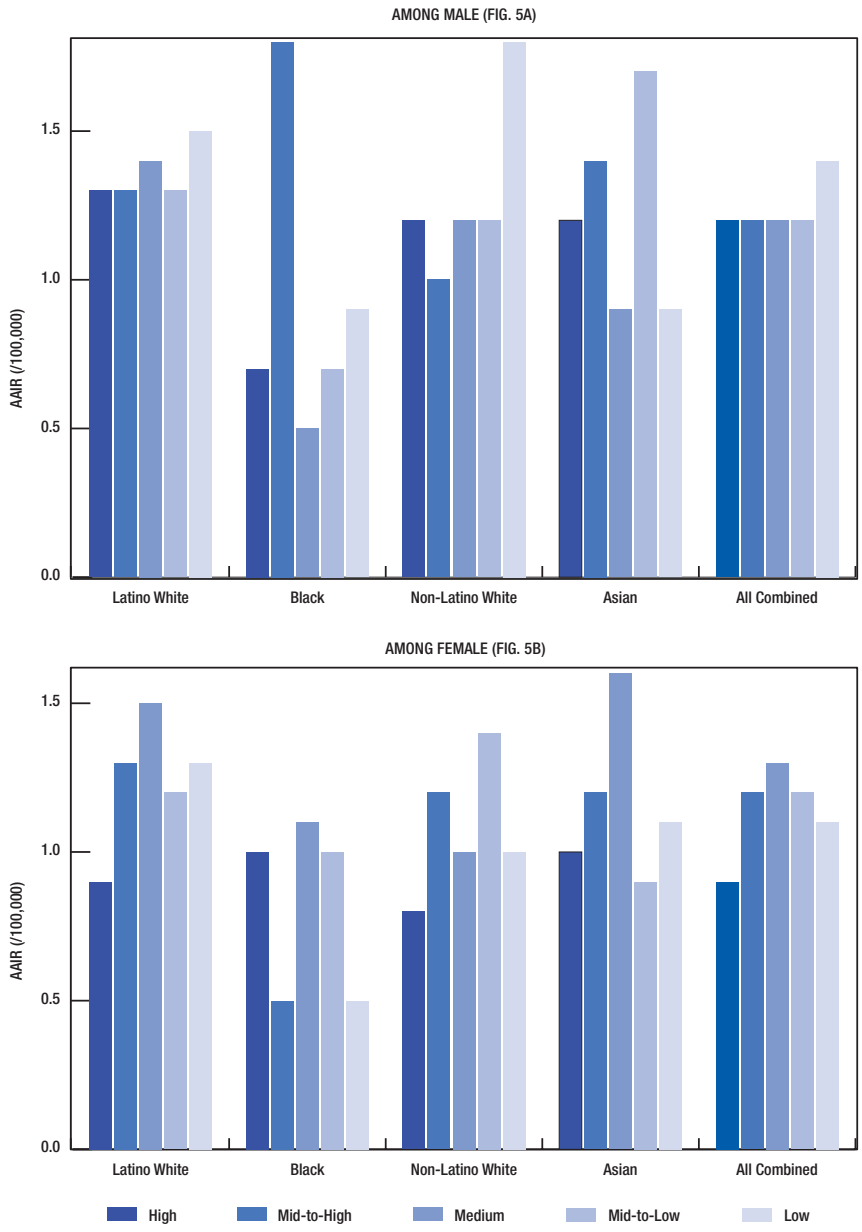
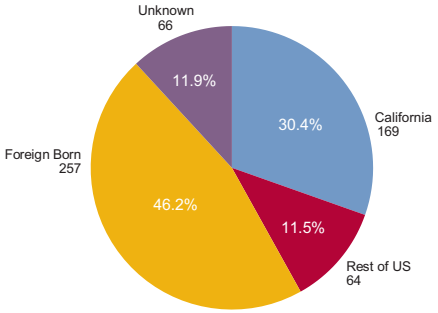
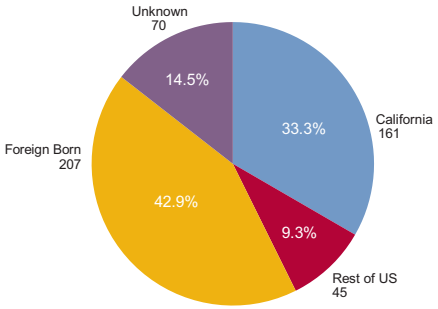


FIGURE 6. FREQUENCY DISTRIBUTION OF BIRTH PLACE FOR AYA ACUTE MYELOID LEUKEMIA BY SEX IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 6A)

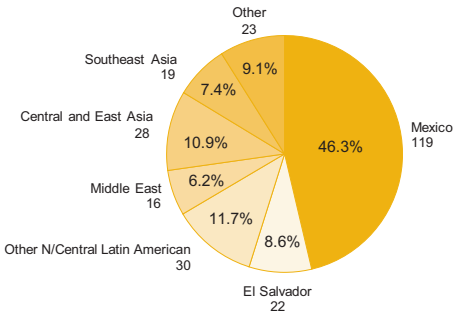


FEMALE (FIG. 6B)



AMONG FOREIGN BORN

MALE (FIG. 6C)



FEMALE (FIG. 6D)

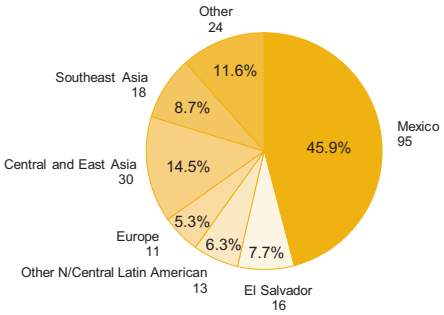
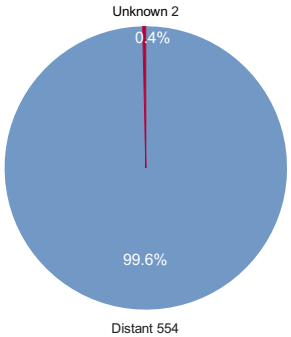
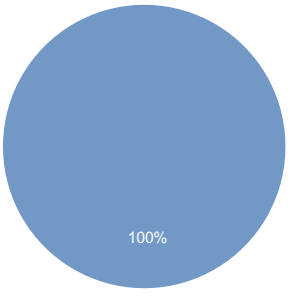


FIGURE 7. DISTRIBUTION OF STAGE OF DISEASE BY SEX FOR AYA ACUTE MYELOID LEUKEMIA IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 7A)



FEMALE (FIG. 7B)



HODGKIN LYMPHOMA

Wendy Cozen, DO

Hodgkin lymphoma is a group of cancers that have in common a large, rare cancer cell termed a Hodgkin-Reed Sternberg cell. There are several subtypes based on appearance under the microscope and the presence of Epstein-Barr virus (EBV) in the tumor, as well as by age of onset.

In Western countries, Hodgkin lymphoma is the most common cancer of young women in their early 20's and the second most common among young men of the same age. Historically, AYA Hodgkin lymphoma in Western countries has been most common among whites of high SES. As economic conditions improve in developing countries and among minority groups in Western countries, the incidence of AYA Hodgkin lymphoma has increased in these groups.

Genetic risk factors have been identified, mostly in genes that control the immune response. Equally important are environmental (non-genetic) risk factors. AYA Hodgkin lymphoma has long been thought to be caused by an abnormal response to a common viral infection acquired after childhood. EBV, the virus that causes infectious mononucleosis, is now considered to be a cause of EBV-positive Hodgkin lymphoma, but this is a small minority of AYA patients in the U.S. The viral culprit for the majority of EBV-negative AYA patients has not yet been discovered.

Initial 5-year survival in AYA patients has been consistently high at about 85%. However, late effects of the chemotherapy or radiotherapy, including second breast, thyroid or hematologic cancers, cardiomyopathy and pulmonary fibrosis, substantially decrease long-term survival.

RATES BY AGE, SEX AND TIME TRENDS

In Los Angeles County, 1,405 and 1,289 new Hodgkin lymphoma cases are diagnosed among male and female AYA patients, respectively, from 1988-2011. AYA females and males have similar incidence rates. The peak for females occurs slightly earlier (at about age 18-20) than that for males (at about age 24) (Figure 1). By the mid-30's, female incidence begins to decrease, while male incidence stays stable, ultimately rising much higher in older ages. Only in younger AYA patients do the sexes have relatively equal incidence, suggesting a different cause in this age group.

Over all AYA ages, time trends have been fairly stable since 1988 (Figure 2), but when examined separately by subtype, the nodular sclerosis classical Hodgkin lymphoma subtype is slightly increasing, whereas the mixed cellularity and other subtypes associated with HIV/AIDS prior to HAART therapy, is decreasing (data not shown). When examined by sex and age within AYA patients, Hodgkin lymphoma is slightly decreasing among the oldest patients and slightly increasing in the youngest patients in both sexes, more prominently among AYA females (Figure 3).

RATES BY RACE/ETHNICITY, SOCIOECONOMIC STATUS AND BIRTHPLACE

AYA male and female non-Latino whites have the highest incidence rates of Hodgkin lymphoma, followed by blacks, and Latinos (Table 2, Figure 4). All Asian subgroups and Pacific Islanders in the AYA age group experience too few Hodgkin lymphoma cancers to reliably assess.

AYA incidence increases with increasing SES status. When examined separately by subtype, the SES gradient is even higher among AYA nodular sclerosis classical Hodgkin lymphoma, but is not evident in AYA mixed cellularity classical Hodgkin lymphoma (data not shown). The majority of AYA Hodgkin lymphoma patients diagnosed from 1988-2011 were born in the U.S. (Figure 6). The largest proportion of foreign-born patients is from Mexico. The next single, largest group of foreign-born patients is Middle Eastern, consisting mostly of Iranians. It is not clear whether this is because there are more Iranian and other Middle Eastern immigrants in the AYA age group living in Los Angeles than many other foreign-born groups, or whether this group experiences a higher risk due to their relatively higher affluence and/or genetic risk factors.

RATES BY STAGE AT DIAGNOSIS

AYA Hodgkin lymphoma is not usually confined to a single lymph node group at diagnosis, therefore regional stage makes up the largest proportion of diagnoses, followed by distant stage.

TABLE 1.
AGE-ADJUSTED INCIDENCE RATE BY AGE FOR AYA HODGKIN LYMPHOMA IN LOS ANGELES COUNTY, 1988-2011

	Males		Females	
Age Group	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
15-24	504	2.8 (2.5–3.0)	494	2.9 (2.7–3.2)
25-34	615	3.1 (2.9–3.4)	580	3.1 (2.8–3.3)
35-39	286	3.2 (2.8–3.5)	215	2.4 (2.1–2.7)
All Ages 15-39	**1,405**	**3.0 (2.8–3.2)**	**1,289**	**2.9 (2.7–3.0)**

TABLE 2. AGE-ADJUSTED INCIDENCE RATE BY AGE AND RACE/ETHNICITY FOR AYA HODGKIN LYMPHOMA IN LOS ANGELES COUNTY, 1988-2011

MALES								
	All Ages 15-24		**All Ages 25-34**		**All Ages 35-39**		**All Ages 15-39**	
Race/Ethnicity	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
Latino White	207	2.2 (1.9-2.5)	190	2.1 (1.8-2.4)	81	2.2 (1.7-2.7)	478	2.2 (2.0-2.3)
Black	51	3.0 (2.2-3.8)	57	3.4 (2.5-4.3)	31	3.8 (2.4-5.1)	139	3.3 (2.8-3.9)
Non-Latino White	208	4.6 (4.0-5.3)	333	5.4 (4.8-5.9)	154	4.8 (4.1-5.6)	695	5.0 (4.6-5.3)
Chinese	<20	—	<20	—	<20	—	<20	—
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	24	2.0 (1.2-2.8)
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—
FEMALES								
Latino White	169	2.0 (1.7-2.3)	166	2.0 (1.7-2.3)	49	1.4 (1.0-1.8)	384	1.9 (1.7-2.1)
Black	47	2.6 (1.9-3.4)	66	3.4 (2.6-4.2)	32	3.3 (2.2-4.5)	145	3.1 (2.6-3.6)
Non-Latino White	245	5.7 (5.0-6.4)	312	5.4 (4.8-6.0)	119	4.0 (3.3-4.8)	676	5.2 (4.8-5.6)
Chinese	<20	—	<20	—	<20	—	<20	—
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	29	2.2 (1.4-3.0)
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—

FIGURE 1. AGE-SPECIFIC RATE BY SEX FOR AYA HODGKIN LYMPHOMA IN LOS ANGELES COUNTY, 1988-2011

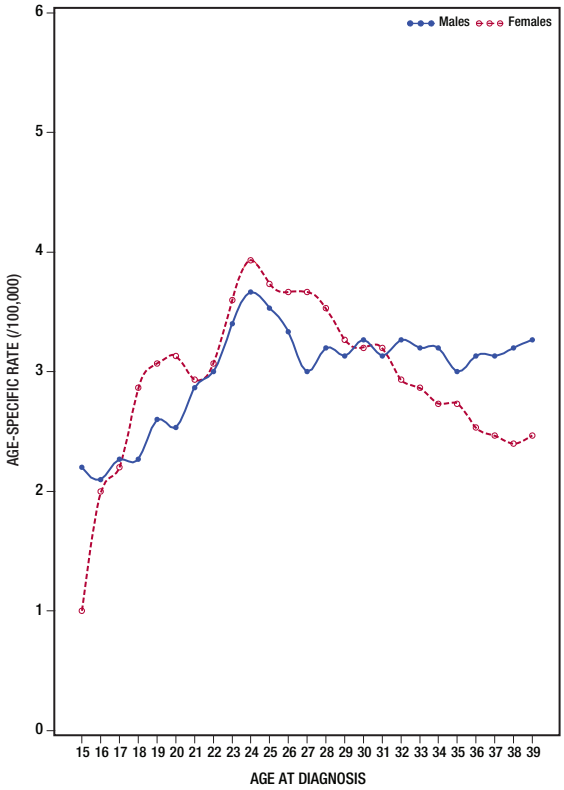


FIGURE 2. TREND IN AGE-ADJUSTED INCIDENCE RATE BY SEX FOR AYA HODGKIN LYMPHOMA IN LOS ANGELES COUNTY, 1988-2011

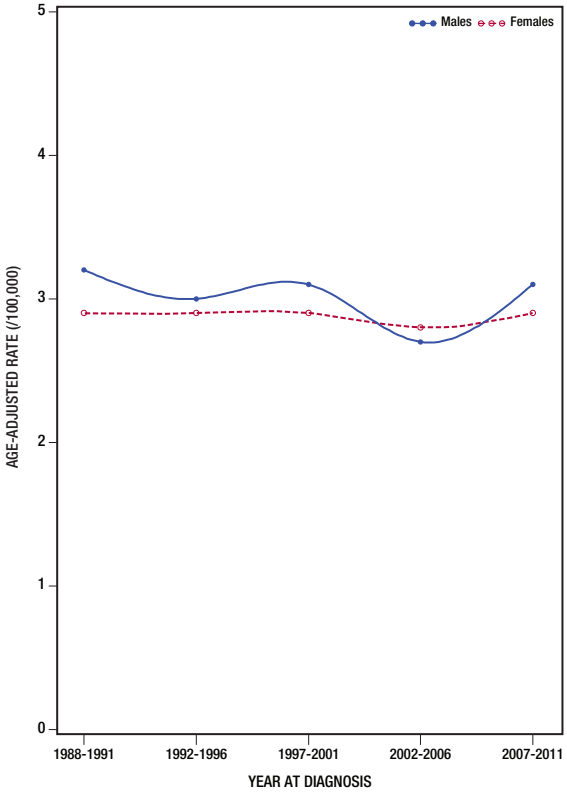


FIGURE 3. TREND IN AGE-SPECIFIC RATE BY SEX FOR AYA HODGKIN LYMPHOMA IN LOS ANGELES COUNTY, 1988-2011

FIG 3(A): MALES

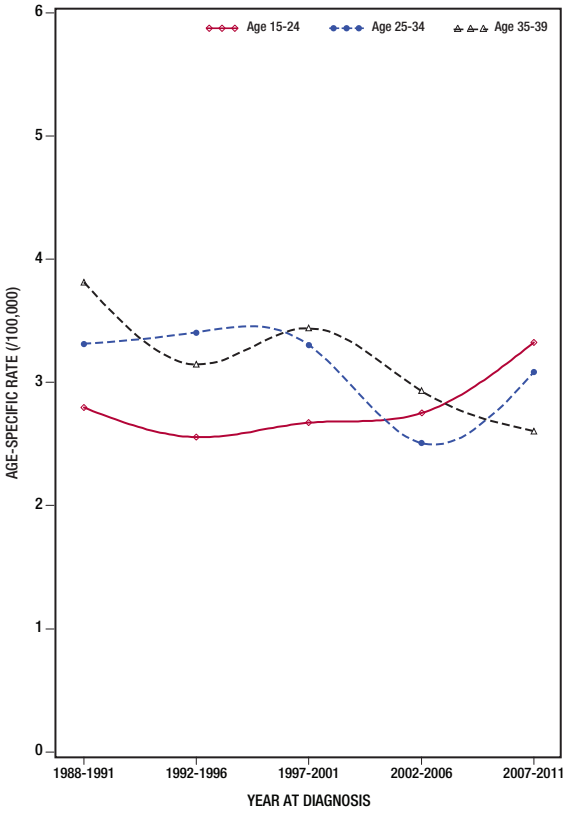


FIG 3(B): FEMALES

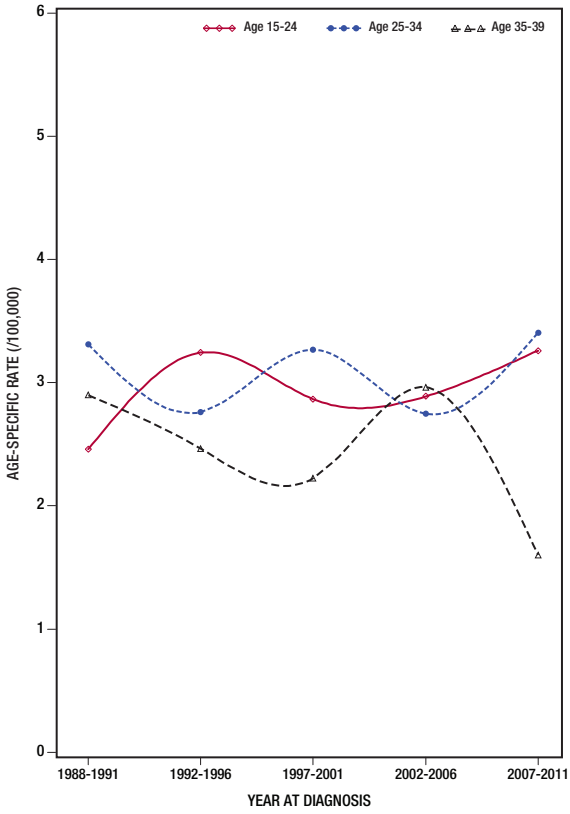


FIGURE 4. AGE-ADJUSTED INCIDENCE RATE BY RACE/ETHNICITY FOR AYA HODGKIN LYMPHOMA IN LOS ANGELES COUNTY, 1988-2011

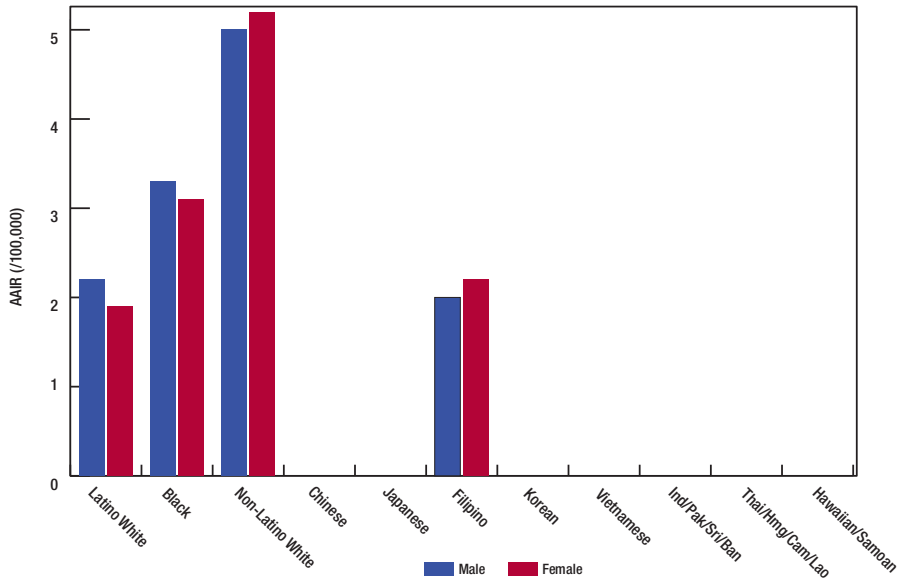


FIGURE 5. AGE-ADJUSTED INCIDENCE RATE BY SES BY RACE/ETHNICITY FOR AYA HODGKIN LYMPHOMA IN LOS ANGELES COUNTY, 1988-2011

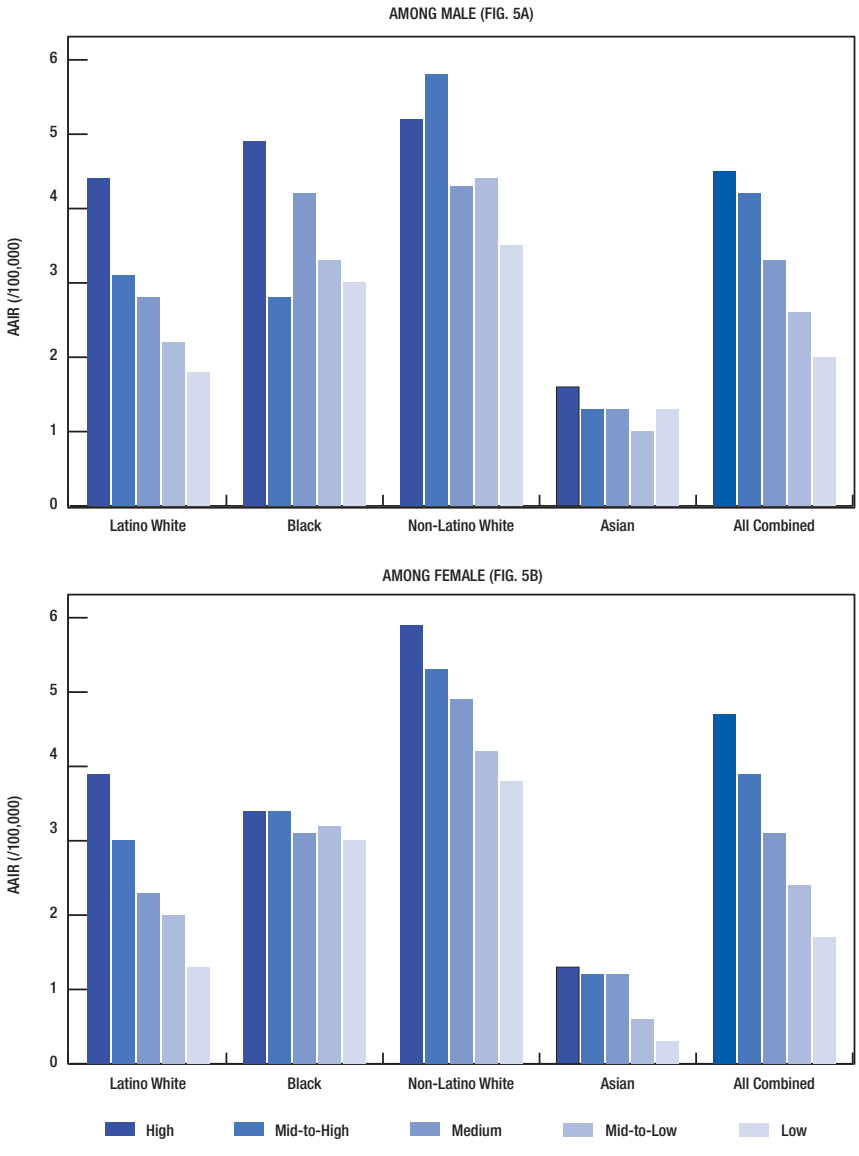
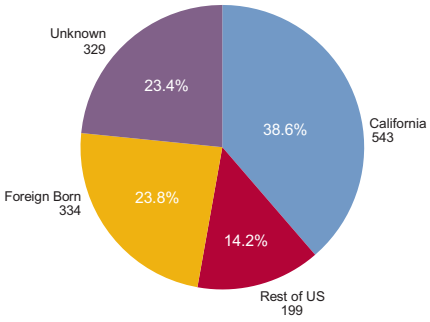
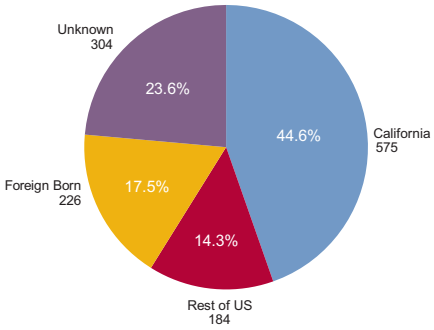


FIGURE 6. FREQUENCY DISTRIBUTION OF BIRTH PLACE FOR AYA HODGKIN LYMPHOMA BY SEX IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 6A)

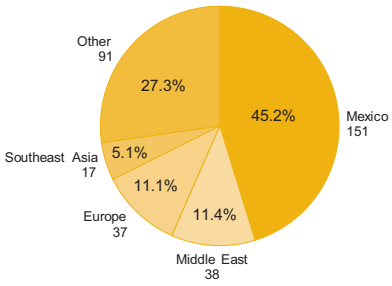


FEMALE (FIG. 6B)



AMONG FOREIGN BORN

MALE (FIG. 6C)



FEMALE (FIG. 6D)

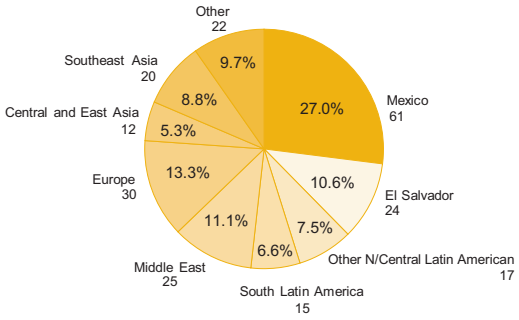
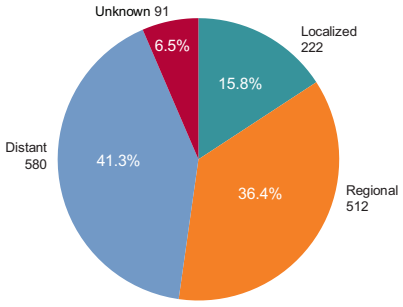
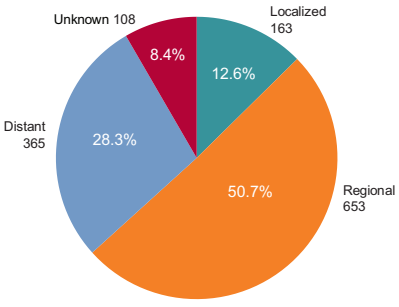


FIGURE 7. FREQUENCY DISTRIBUTION OF STAGE OF DISEASE BY SEX FOR AYA HODGKIN LYMPHOMA IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 7A)



FEMALE (FIG. 7B)



NON-HODGKIN LYMPHOMA

Wendy Cozen, DO

Non-Hodgkin lymphoma is an umbrella term for cancers arising from one of the three types of blood cells. Taken as a whole, non-Hodgkin lymphomas are the fifth most common cancer diagnosis in Western countries over all ages, and the third most common in children. There have been at least three major new classifications of non-Hodgkin lymphoma since the 1970's. Non-Hodgkin lymphoma is a cancer of the immune system and thus the most important risk factors are immunological. Patients with impaired immune systems have over 50 times increased risk. For instance, patients undergoing bone marrow transplants are at increased risk of non-Hodgkin lymphoma. Infections that weaken the immune system such as HIV/AIDS profoundly increase the risk of non-Hodgkin lymphoma. Prior to the introduction of highly-active retroviral therapy (HAART) in the mid-1990's to control HIV/AIDS progression, non-Hodgkin lymphoma incidence dramatically increased in young men. Other infections and conditions that chronically stimulate the immune system, such as autoimmune diseases and chronic infections, are also risk factors.

RATES BY AGE, SEX AND TIME TRENDS

From 1988-2011, 2,854 and 1,247 new non-Hodgkin lymphoma cases were diagnosed among male and female AYA patients in Los Angeles County. Similar to most other blood cancers and to non-Hodgkin lymphoma at other ages, AYA males have a higher incidence rate compared to AYA females (Table 1). This difference increased with age, becoming more pronounced after the mid-20's (Figure 1). It is important to note that males and females have a different distribution of non-Hodgkin lymphoma subtypes.

There was a sharp increase in non-Hodgkin lymphoma incidence rates among AYA males between 1988 and 1992, and then a relatively slow decline until 2001, when incidence rates stabilized (Figure 2). This pattern is most pronounced among the oldest AYA males 35-39 (Figure 3). Much of the increasing trend is attributable to HIV/AIDS infection. HAART was introduced in 1996, but the decrease in incidence began prior to that for reasons that are unclear. Among AYA females, non-Hodgkin lymphoma rates increased only slightly from 1988 to the mid-1990's, mainly among the oldest AYA age group, and then stabilized (Figures 2 and 3).

RATES BY RACE/ETHNICITY, SOCIOECONOMIC STATUS AND BIRTHPLACE

Non-Latino white AYA males have by far the highest incidence rates of non-Hodgkin lymphoma within each age group, followed by black and Latino males (Table 2, Figure 4). The higher incidence in non-Latino white males, especially in the oldest AYA age groups, is due to HIV/AIDS. Chinese, Japanese, Korean and Vietnamese males have the lowest incidence rates among Los Angeles County AYA males (Table 2, Figure 4). The order of incidence by race/ethnicity among AYA females is similar to that in AYA males, however, the inter-ethnic differences are much less pronounced (Table 2).

AYA incidence of non-Hodgkin lymphoma is variably associated with SES (Figure 5). Among all AYA males, Latino white AYA males, and to some extent, Asian males, non-Hodgkin lymphoma incidence increased with increasing SES. Among non-Latino white males, the SES trend is inverse, with highest incidence among the lowest SES groups. More subtle trends are present in females, with the suggestion of an increasing incidence with increasing SES across most racial/ethnic groups.

The largest proportion of male and female AYA non-Hodgkin patients during this period are U.S. born (Figure 6). One-third of male and female AYA patients are foreign born, and of these, the largest proportion are from Mexico.

RATES BY STAGE AT DIAGNOSIS

There are three major stage classifications for non-Hodgkin lymphoma, two of which roughly correspond to the CSP categories. AYA non-Hodgkin lymphoma is not usually confined to a single lymph node group at diagnosis, therefore local stage disease accounts for the smallest proportion (Figure 7). Distant stage makes up the largest proportion of diagnoses (47% in AYA males, 40% in AYA females), followed by regional stage (14% in AYA males, 19% in AYA females).

TABLE 1.
AGE-ADJUSTED INCIDENCE RATE BY AGE FOR AYA NON-HODGKIN LYMPHOMA IN LOS ANGELES COUNTY, 1988-2011

	Males		Females	
Age Group	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
15-24	385	2.1 (1.9–2.3)	226	1.3 (1.2–1.5)
25-34	1,334	6.9 (6.5–7.3)	557	3.0 (2.8–3.3)
35-39	1,135	12.6 (11.8–13.3)	464	5.2 (4.7–5.7)
All Ages 15-39	**2,854**	**6.3 (6.1–6.6)**	**1,247**	**2.9 (2.7–3.0)**

TABLE 2. AGE-ADJUSTED INCIDENCE RATE BY AGE AND RACE/ETHNICITY FOR AYA NON-HODGKIN LYMPHOMA IN LOS ANGELES COUNTY, 1988-2011

MALES								
	All Ages 15-24		**All Ages 25-34**		**All Ages 35-39**		**All Ages 15-39**	
Race/Ethnicity	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
Latino White	183	1.9 (1.6-2.2)	522	5.9 (5.4-6.4)	341	9.2 (8.2-10.2)	1,046	5.1 (4.8-5.4)
Black	38	2.2 (1.5-2.9)	128	7.7 (6.4-9.0)	129	15.7 (13.0-18.4)	295	7.4 (6.5-8.2)
Non-Latino White	121	2.7 (2.2-3.2)	586	9.5 (8.8-10.3)	601	18.8 (17.3-20.3)	1,308	9.0 (8.5-9.5)
Chinese	<20	—	<20	—	<20	—	40	2.7 (1.8-3.5)
Japanese	<20	—	<20	—	<20	—	21	4.1 (2.3-5.9)
Filipino	<20	—	<20	—	<20	—	40	3.4 (2.3-4.4)
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	22	5.1 (3.0-7.3)
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—
FEMALES								
Latino White	99	1.2 (0.9-1.4)	194	2.4 (2.1-2.7)	163	4.6 (3.9-5.3)	456	2.4 (2.2-2.6)
Black	30	1.7 (1.1-2.3)	70	3.6 (2.8-4.5)	55	5.7 (4.2-7.3)	155	3.3 (2.8-3.9)
Non-Latino White	62	1.4 (1.1-1.8)	215	3.8 (3.3-4.3)	175	5.9 (5.1-6.8)	452	3.4 (3.0-3.7)
Chinese	<20	—	<20	—	<20	—	42	2.5 (1.7-3.3)
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	41	3.0 (2.1-4.0)
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—

FIGURE 1. AGE-SPECIFIC RATE BY SEX FOR AYA NON-HODGKIN LYMPHOMA IN LOS ANGELES COUNTY, 1988-2011

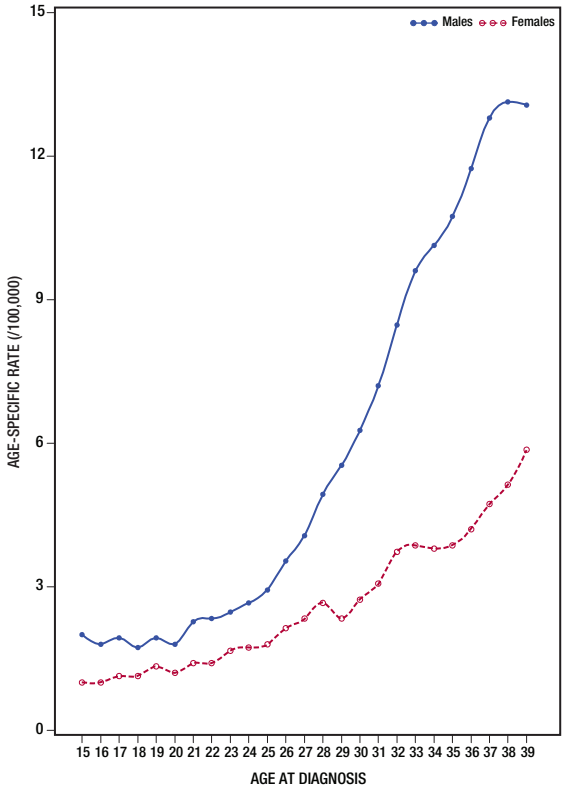


FIGURE 2. TREND IN AGE-ADJUSTED INCIDENCE RATE BY SEX FOR AYA NON-HODGKIN LYMPHOMA IN LOS ANGELES COUNTY, 1988-2011

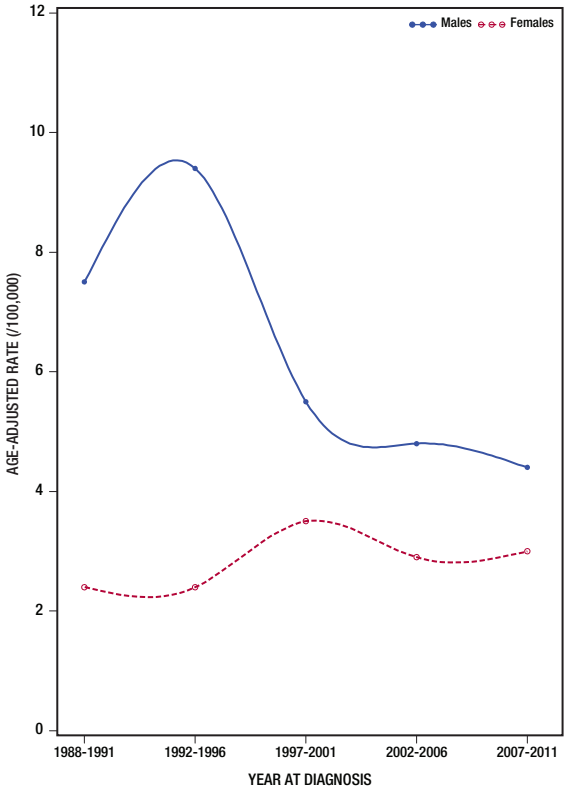


FIGURE 3. TREND IN AGE-SPECIFIC RATE BY SEX FOR AYA NON-HODGKIN LYMPHOMA IN LOS ANGELES COUNTY, 1988-2011

FIG 3(A): MALES

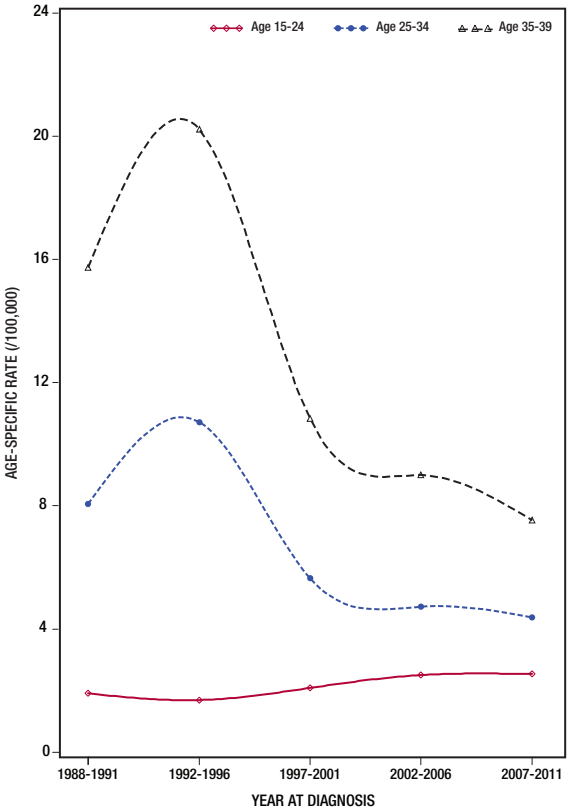


FIG 3(B): FEMALES

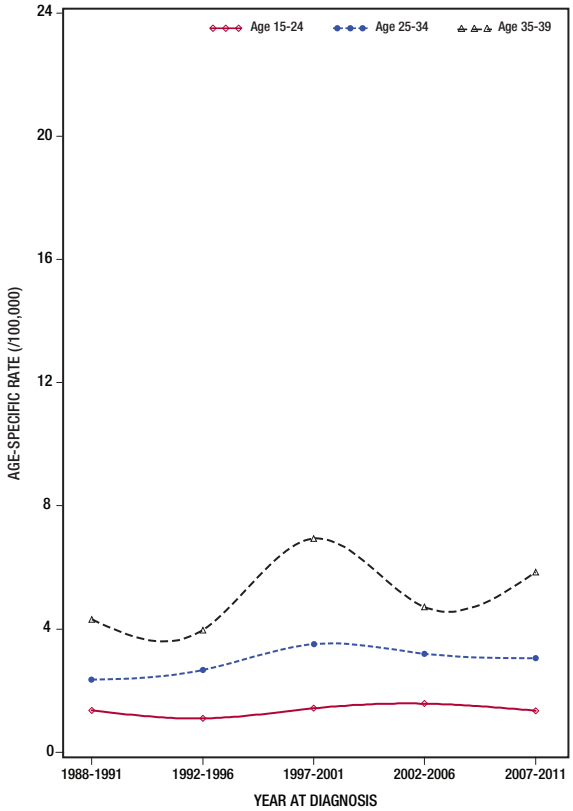


FIGURE 4. AGE-ADJUSTED INCIDENCE RATE BY RACE/ETHNICITY FOR AYA NON-HODGKIN LYMPHOMA IN LOS ANGELES COUNTY, 1988-2011

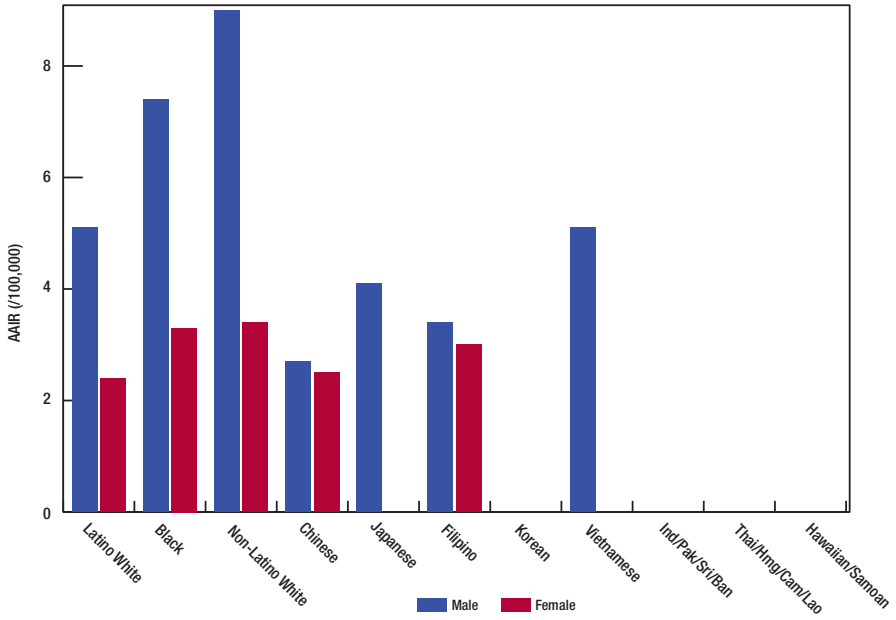
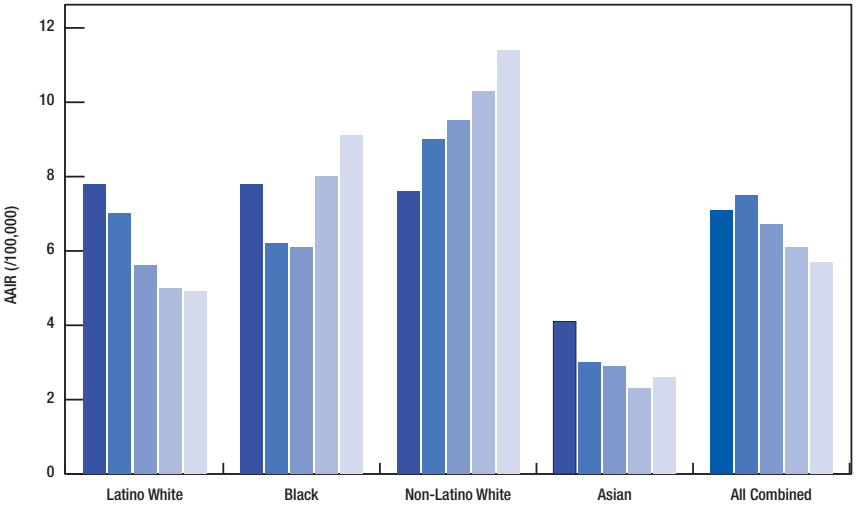


FIGURE 5. AGE-ADJUSTED INCIDENCE RATE BY SES BY RACE/ETHNICITY FOR AYA NON-HODGKIN LYMPHOMA IN LOS ANGELES COUNTY, 1988-2011

AMONG MALE (FIG. 5A)



AMONG FEMALE (FIG. 5B)

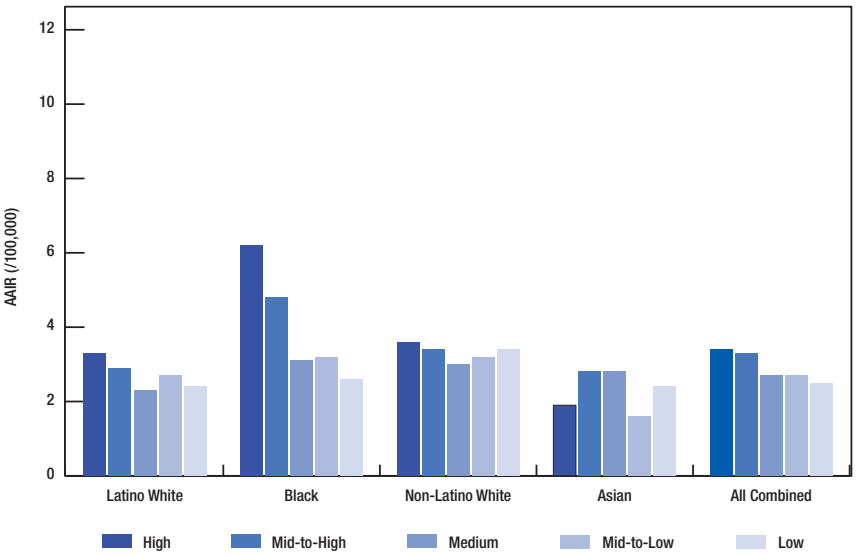
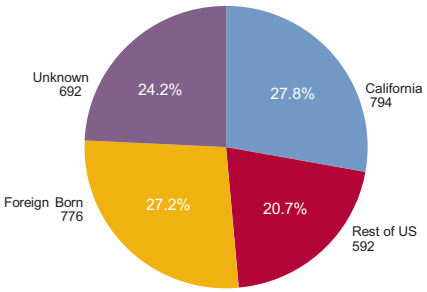
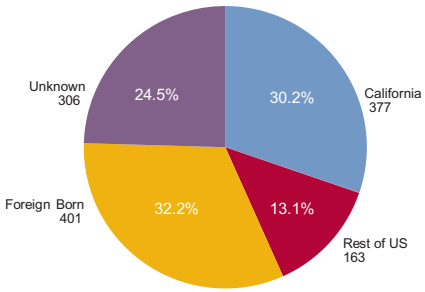


FIGURE 6. FREQUENCY DISTRIBUTION OF BIRTH PLACE FOR AYA NON-HODGKIN LYMPHOMA BY SEX IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 6A)

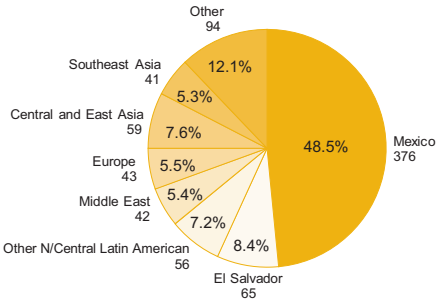


FEMALE (FIG. 6B)



AMONG FOREIGN BORN

MALE (FIG. 6C)



FEMALE (FIG. 6D)

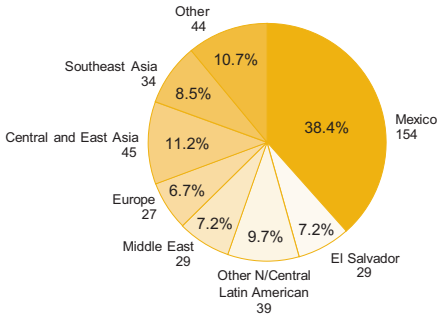
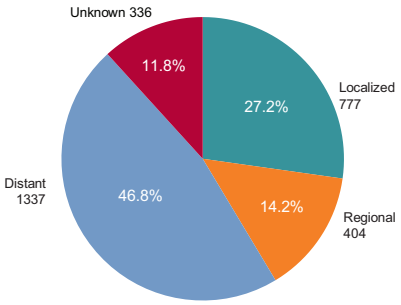
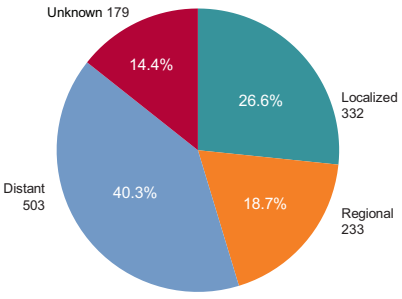


FIGURE 7. FREQUENCY DISTRIBUTION OF STAGE OF DISEASE BY SEX FOR AYA NON-HODGKIN LYMPHOMA IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 7A)



FEMALE (FIG. 7B)



MELANOMA

Myles Cockburn, PhD

Melanoma is among the five most common cancers in most Western countries, with the highest rates worldwide occurring in Australia, New Zealand and California. Although melanoma incidence rates increase with age and the majority occurs among older adults, melanoma is the third most common cancer among AYA in the U.S. Overall rates of melanoma have increased steadily for the past 30 years, primarily among older adults (ages 40+) and young women (ages 15-39). While screening efforts have contributed to increased rates of thinner tumors (early stage tumors) in the past three decades, rates of thicker tumors have also increased, suggesting a true increase in rates beyond a screening effect.

While lifetime sun exposure and frequency of sunburns are well known risk factors for adult melanoma, these factors have not been consistently linked to melanoma risk among AYAs. For all age groups, the highest risks are among people with light hair, skin and eye color, skin that burns rather than tans, and more large skin moles. A family history of melanoma and intentional tanning (e.g., sunbed use) are also risk factors for melanoma among both AYA and older adults. California has among the highest rates of melanoma in the world, mostly attributable to high ultraviolet radiation exposures (from the sun or tanning bed use) and a largely non-Latino white population.

Melanoma is more common among AYA females than males, while males have a higher risk of melanoma after age 40. Rates are highest among non-Latino whites although rates among Latinos are on the rise, particularly in California. The 5-year survival rate among AYAs is 94%, compared to 91% among adults aged 40-64, and 83% among adults aged 65 and older, with poorer survival for people with thicker tumors. Persons with higher SES have higher melanoma risk in most populations.

RATES BY AGE, SEX AND TIME TRENDS

In Los Angeles County, approximately 173 cases of melanoma are diagnosed among AYAs each year. Incidence rates among females are higher than males for each age group within AYA (Figure 1 and Figure 3). Between 1988 and 2011, the age adjusted incidence rate of melanoma among AYAs in Los Angeles County is higher for females than for males (Table 1), reflecting an approximately 20-25% decrease in the past three decades (Figure 2), although rates have been relatively stable for the past 15 years.

RATES BY RACE/ETHNICITY, SOCIOECONOMIC STATUS AND BIRTHPLACE

The highest melanoma rates in AYAs are among non-Latina white females and non-Latino white males (Table 2 and Figure 4). As is the case in older adults, there are strong SES patterns with more affluent AYAs having higher rates of melanoma (Figure 5), and this appears to be true among all race/ethnic groups.

While birthplace information is unavailable for 49% of the cases diagnosed in Los Angeles County, for those cases where data are available, approximately 82% of the cases are born in the U.S. and 18% are born outside of the U.S. (Figure 6), mostly in North and Central America and Europe. 65% of U.S. born cases were born in California, including 79% of the cases among 15-24 year olds being California born (not shown).

RATES BY STAGE AT DIAGNOSIS

The large majority of tumors among AYAs in Los Angeles County are diagnosed at a localized stage (84% for males, 89% for females), with males having higher risks of distant disease or a tumor that was unstageable (typically, unstageable tumors are late stage tumors) (Figure 7). Among cases aged 15-24 years, females are more likely than males to be diagnosed with late stage disease, while males have higher rates of late stage disease among cases aged 25-39 years (not shown).

TABLE 1.
AGE-ADJUSTED INCIDENCE RATE BY AGE FOR AYA MELANOMA IN LOS ANGELES COUNTY, 1988-2011

	Males		Females	
Age Group	N	AAIR (95%CI)	N	AAIR (95%CI)
15-24	231	1.3 (1.1–1.4)	323	1.9 (1.7–2.1)
25-34	840	4.3 (4.0–4.6)	1,182	6.3 (6.0–6.7)
35-39	728	8.1 (7.5–8.6)	846	9.5 (8.8–10.1)
All Ages 15-39	1,799	4.0 (3.8–4.2)	2,351	5.3 (5.1–5.5)

TABLE 2. AGE-ADJUSTED INCIDENCE RATE BY AGE AND RACE/ETHNICITY FOR AYA MELANOMA IN LOS ANGELES COUNTY, 1988-2011

MALES								
	All Ages 15-24		All Ages 25-34		All Ages 35-39		All Ages 15-39	
Race/Ethnicity	N	AAIR (95%CI)	N	AAIR (95%CI)	N	AAIR (95%CI)	N	AAIR (95%CI)
Latino White	33	0.3 (0.2-0.4)	81	0.9 (0.7-1.1)	61	1.6 (1.2-2.1)	175	0.9 (0.7-1.0)
Black	<20	—	<20	—	<20	—	<20	—
Non-Latino White	164	3.6 (3.1-4.2)	669	10.8 (10.0-11.7)	607	19.0 (17.5-20.5)	1,440	9.9 (9.4-10.4)
Chinese	<20	—	<20	—	<20	—	<20	—
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	<20	—
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—
FEMALES								
Latino White	40	0.5 (0.3-0.6)	149	1.8 (1.5-2.1)	111	3.1 (2.5-3.7)	300	1.6 (1.4-1.8)
Black	<20	—	<20	—	<20	—	20	0.4 (0.2-0.6)
Non-Latino White	240	5.3 (4.7-6.0)	914	16.0 (15.0-17.0)	645	21.9 (20.2-23.6)	1,799	13.2 (12.6-13.8)
Chinese	<20	—	<20	—	<20	—	<20	—
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	<20	—
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—

FIGURE 1. AGE-SPECIFIC RATE BY SEX FOR AYA MELANOMA IN LOS ANGELES COUNTY, 1988-2011

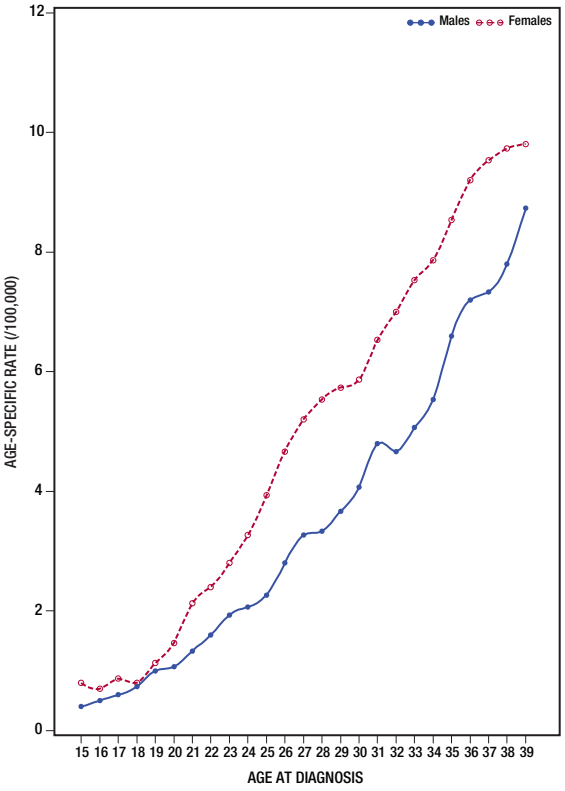


FIGURE 2. TREND IN AGE-ADJUSTED INCIDENCE RATES BY SEX FOR AYA MELANOMA IN LOS ANGELES COUNTY, 1988-2011

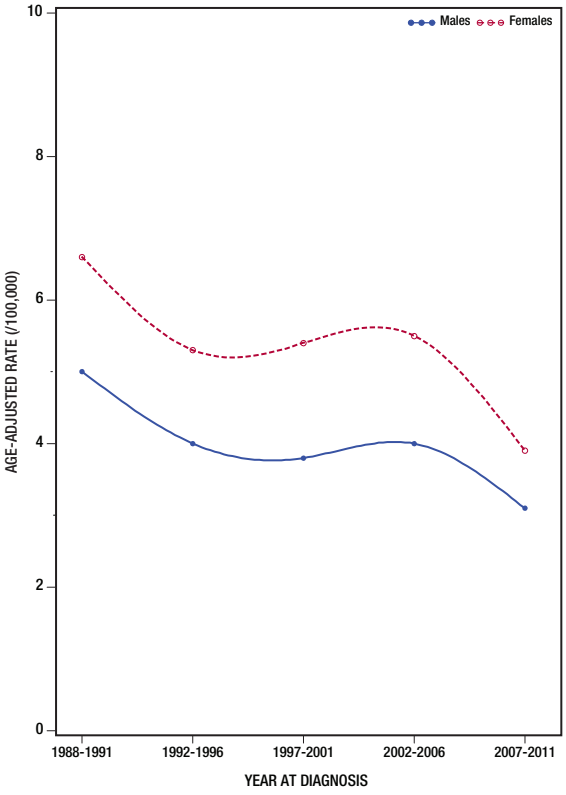


FIGURE 3. TREND IN AGE-SPECIFIC RATE BY SEX FOR AYA MELANOMA IN LOS ANGELES COUNTY, 1988-2011

FIG 3(A): MALES

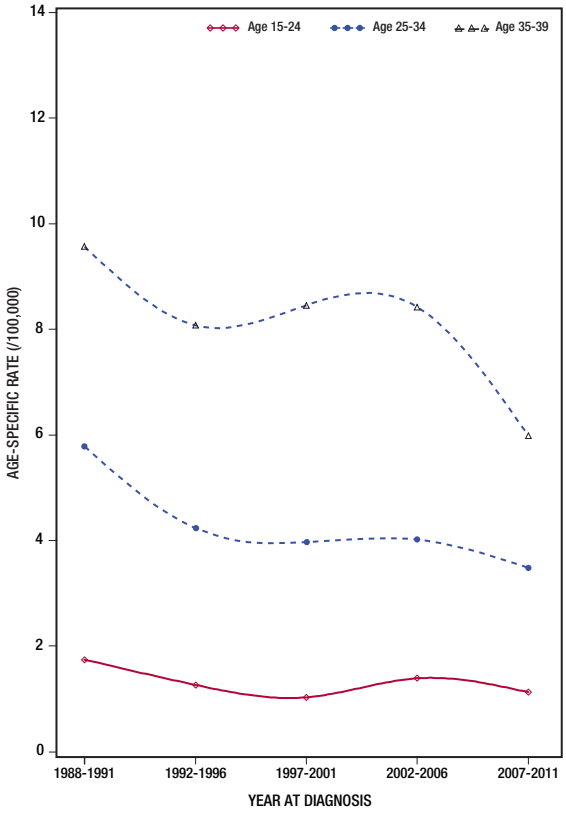


FIG 3(B): FEMALES

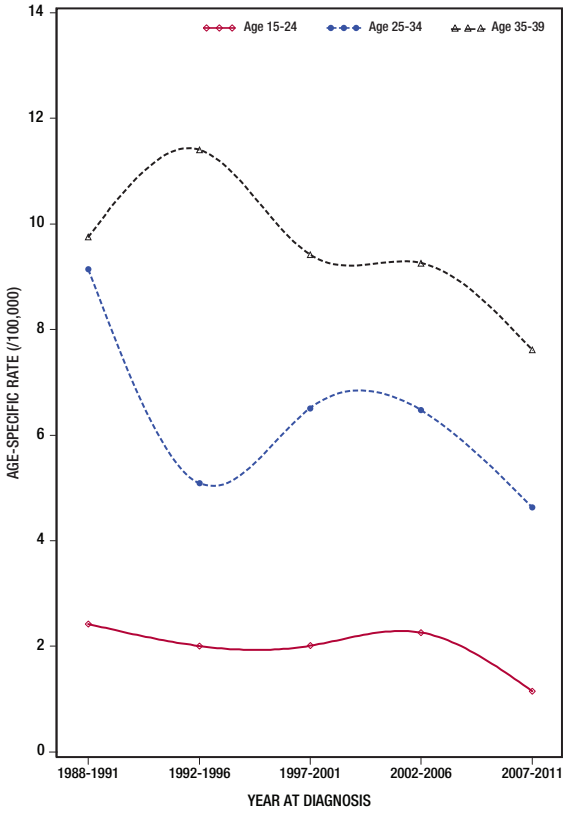


FIGURE 4. AGE-ADJUSTED INCIDENCE RATE BY RACE/ETHNICITY FOR AYA MELANOMA IN LOS ANGELES COUNTY, 1988-2011

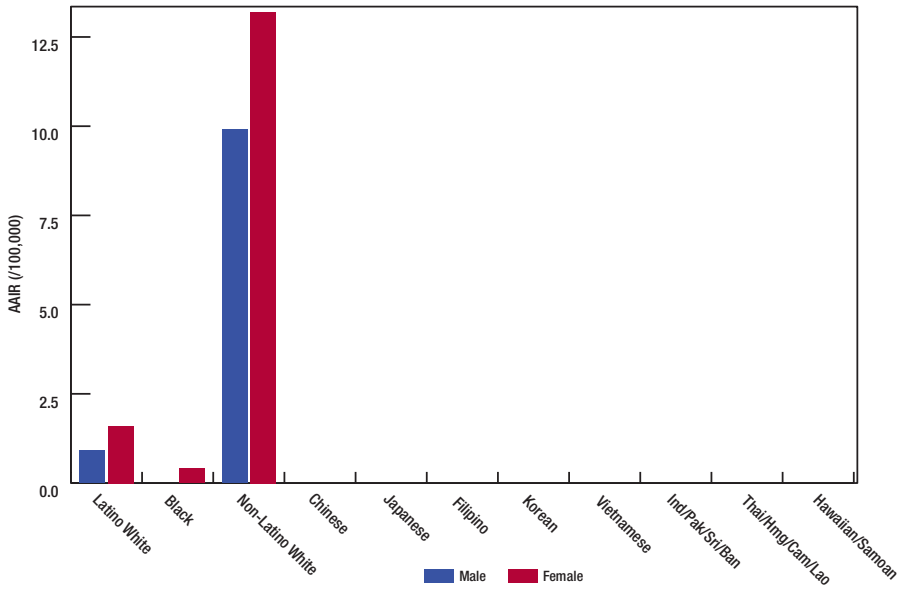


FIGURE 5. AGE-ADJUSTED INCIDENCE RATE BY SES BY RACE/ETHNICITY FOR AYA MELANOMA IN LOS ANGELES COUNTY, 1988-2011

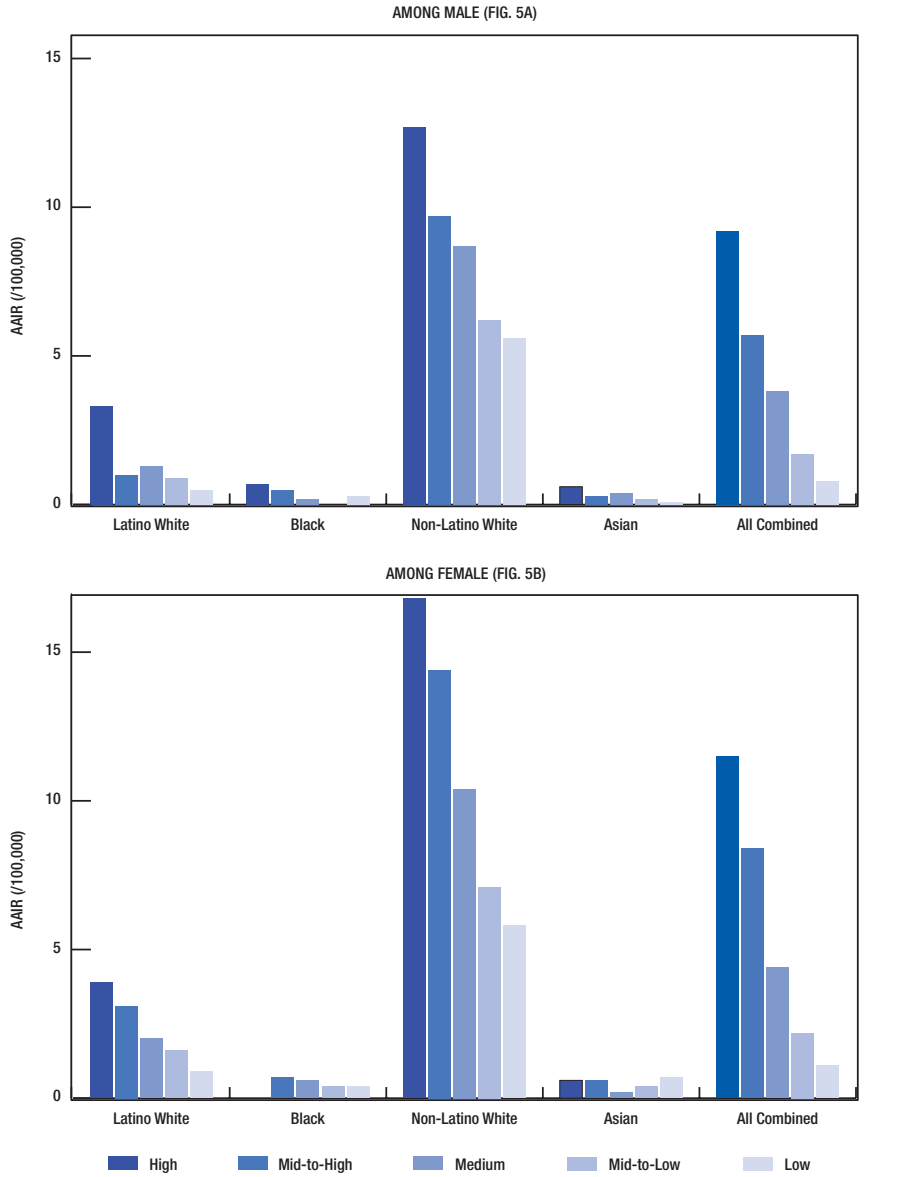
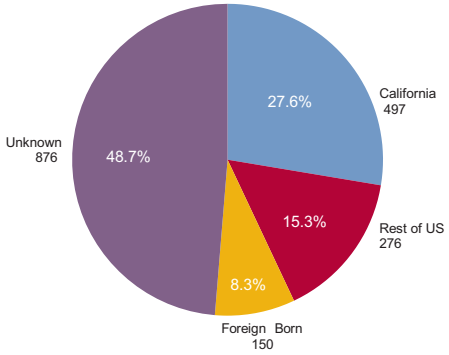
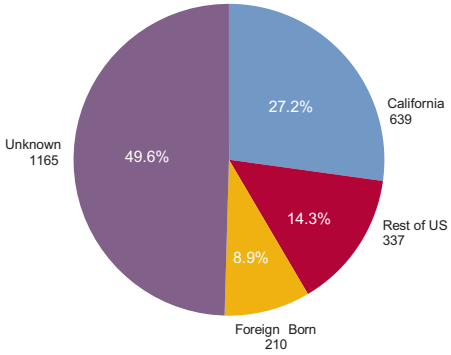


FIGURE 6. FREQUENCY DISTRIBUTION OF BIRTH PLACE FOR AYA MELANOMA BY SEX IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 6A)

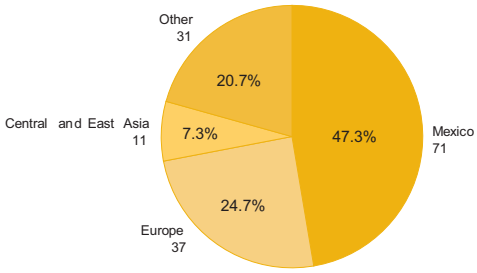


FEMALE (FIG. 6B)



AMONG FOREIGN BORN

MALE (FIG. 6C)



FEMALE (FIG. 6D)

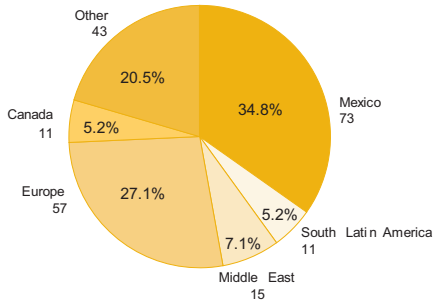
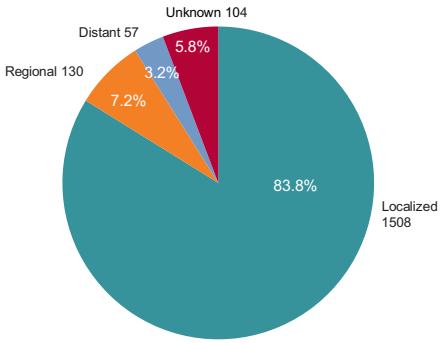
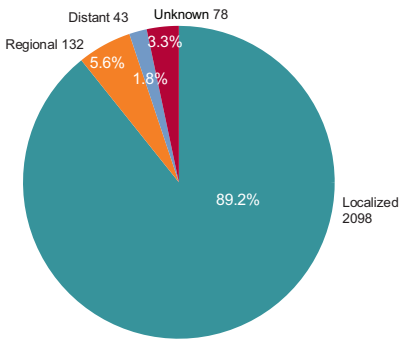


FIGURE 7. FREQUENCY DISTRIBUTION OF STAGE OF DISEASE BY SEX FOR AYA MELANOMA IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 7A)



FEMALE (FIG. 7B)



OVARY

Anna Wu, PhD

Invasive epithelial ovarian cancer (ovarian cancer) is a rare disease, often with a poor outcome. Overall five-year survival is less than 50% due largely to the fact that most of these cancers are diagnosed at an advanced stage. Factors that protect against ovarian cancer are increasing number of childbirths, oral contraceptive use, and tubal ligation. Women with a family history of ovarian cancer or endometriosis are at increased risk. Although rare, women who carry mutations (changes) in major ovarian cancer genes such as BRCA1 and BRCA2 are also at much higher risk of ovarian cancer. In addition, other genetic factors have been identified which have modest influences on risk. There is a need to better understand the causes of ovarian cancer by age at diagnosis and by tissue type.

RATES BY AGE, SEX AND TIME TRENDS

In Los Angeles County, approximately 37 cases of ovarian cancer are diagnosed among AYA each year, representing about 6% of all ovarian cancers diagnosed per year. Incidence rates of ovarian cancer increase steadily with age (Figure 1); rates are low for those aged 15-24 but the rates more than triple for females aged 25-34 and 35-39 (Table 1). The overall rates within AYA females are relatively stable between 1988 and 2011 (Figure 2).

RATES BY RACE/ETHNICITY, SOCIOECONOMIC STATUS AND BIRTHPLACE

As is the case in older females, ovarian cancer rates in AYA are highest in non-Latina whites, intermediate in Latina whites, and lowest in blacks. Ovarian cancer rates in AYA Asians tend to be as high if not higher than the rates in non-Latino whites. In particular, rates in Filipinos exceed the rates in AYA non-Latina whites (Figure 4). Rates of ovarian cancer in AYA tended to be lower among lower SES but this pattern is not consistent across the different race/ethnic groups. Some of the variation may be due to small numbers.

Birthplace information is unknown for 24% of the cases diagnosed in Los Angeles County. For those cases where data are available, 51% of the cases are born in the US (36% were born in California, 16% elsewhere in the US). Of the 49% of the cases who were born outside of the US, approximately 45% were from Mexico and El Salvador, and 30% were from Asia (Figure 6a and 6b).

RATES BY STAGE AT DIAGNOSIS

For AYA in Los Angeles County, 60% are diagnosed at advanced stages (regional and distant stages) and 38% are localized stage (Figure 7).

TABLE 1.
AGE-ADJUSTED INCIDENCE RATE BY AGE FOR AYA CARCINOMA OF OVARY IN LOS ANGELES COUNTY, 1988-2011

Age Group	N	AAIR (95%CI)
15-24	75	0.4 (0.3–0.5)
25-34	377	2.0 (1.8–2.2)
35-39	428	4.8 (4.3–5.3)
All Ages 15-39	**880**	**2.0 (1.9–2.2)**

TABLE 2. AGE-ADJUSTED INCIDENCE RATE BY AGE AND RACE/ETHNICITY FOR AYA CARCINOMA OF OVARY IN LOS ANGELES COUNTY, 1988-2011

FEMALES								
	All Ages 15-24		All Ages 25-34		All Ages 35-39		All Ages 15-39	
Race/Ethnicity	N	AAIR (95%CI)	N	AAIR (95%CI)	N	AAIR (95%CI)	N	AAIR (95%CI)
Latino White	34	0.4 (0.3-0.5)	143	1.8 (1.5-2.0)	153	4.3 (3.6-5.0)	330	1.8 (1.6-2.0)
Black	<20	—	24	1.2 (0.7-1.7)	24	2.5 (1.5-3.5)	52	1.1 (0.8-1.4)
Non-Latino White	22	0.5 (0.3-0.7)	134	2.4 (2.0-2.8)	172	5.8 (5.0-6.7)	328	2.4 (2.2-2.7)
Chinese	<20	—	<20	—	<20	—	36	2.2 (1.5-2.9)
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	23	7.7 (4.5-10.8)	44	3.2 (2.3-4.2)
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—

FIGURE 1. AGE-SPECIFIC RATE FOR AYA CARCINOMA OF OVARY IN LOS ANGELES COUNTY, 1988-2011

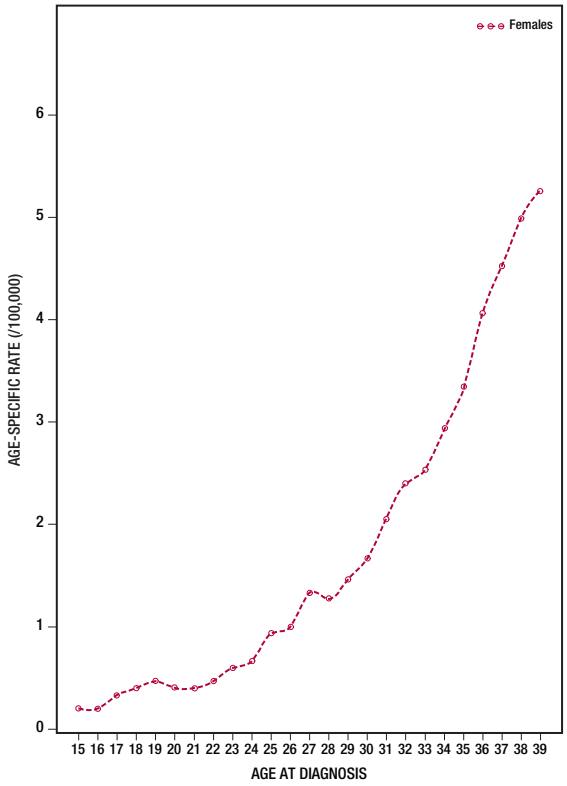


FIGURE 2. TREND IN AGE-ADJUSTED INCIDENCE RATE FOR AYA CARCINOMA OF OVARY IN LOS ANGELES COUNTY, 1988-2011

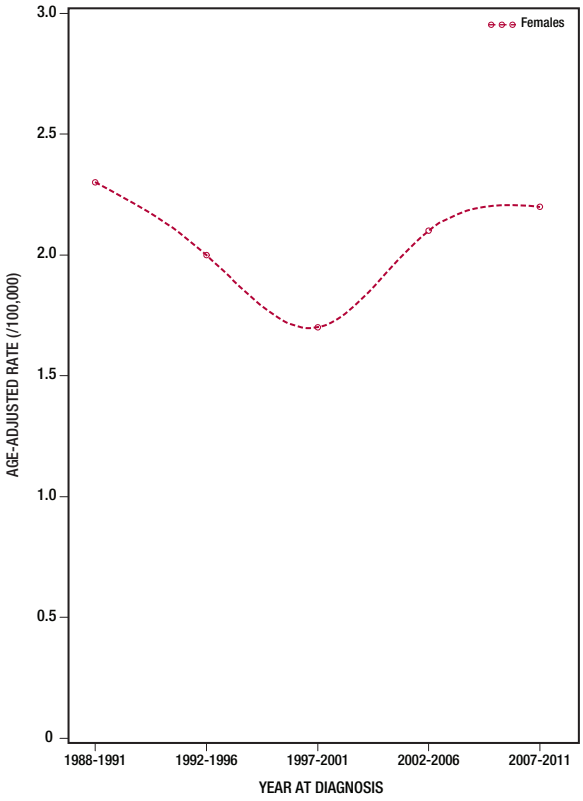


FIGURE 3. TREND IN AGE-SPECIFIC RATE FOR AYA CARCINOMA OF OVARY IN LOS ANGELES COUNTY, 1988-2011

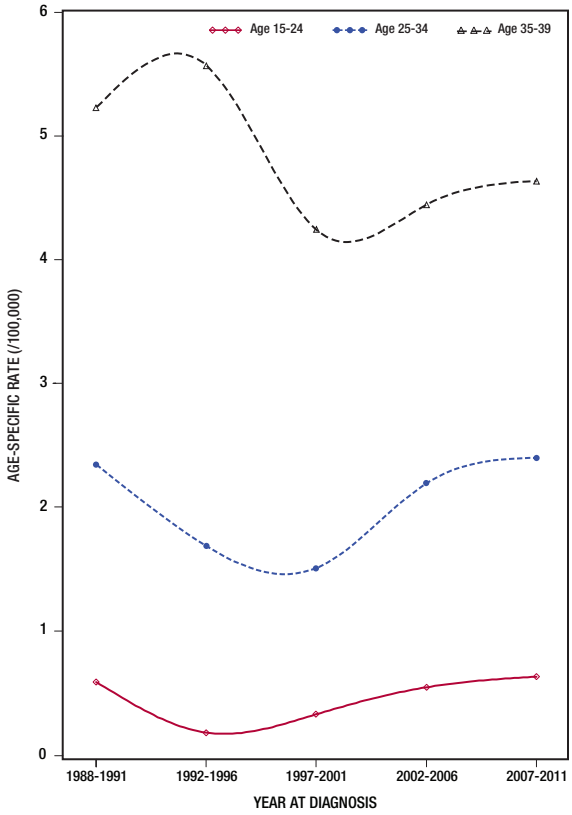


FIGURE 4. AGE-ADJUSTED INCIDENCE RATE BY RACE/ETHNICITY FOR AYA CARCINOMA OF OVARY IN LOS ANGELES COUNTY, 1988-2011

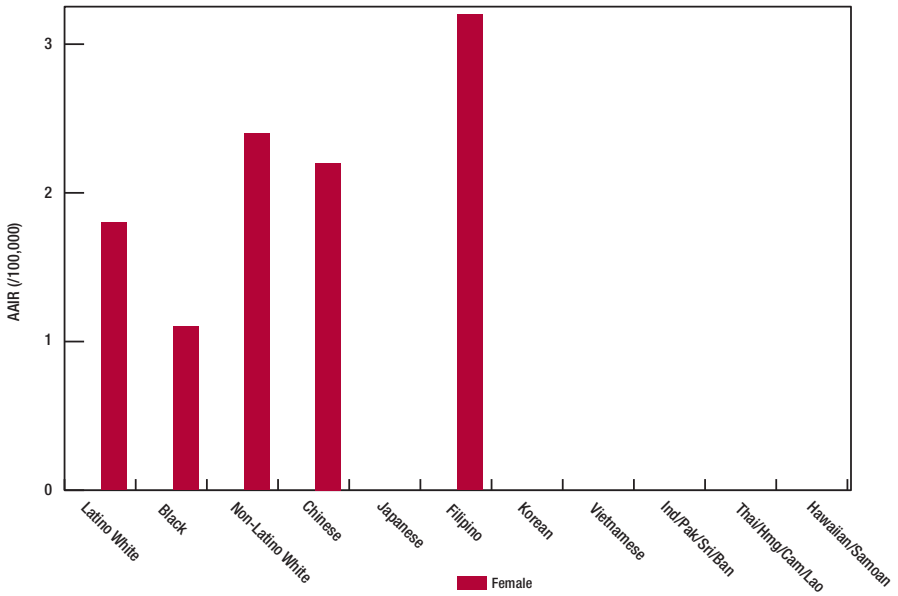


FIGURE 5. AGE-ADJUSTED INCIDENCE RATE BY SES BY RACE/ETHNICITY FOR AYA CARCINOMA OF OVARY IN LOS ANGELES COUNTY, 1988-2011

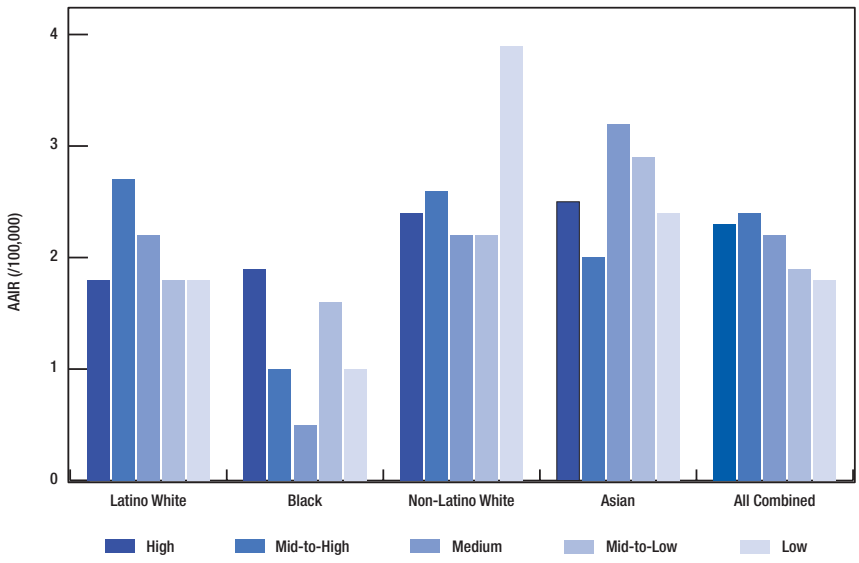
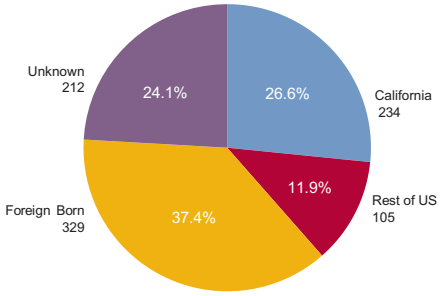


FIGURE 6. FREQUENCY DISTRIBUTION OF BIRTH PLACE FOR AYA CARCINOMA OF OVARY IN LOS ANGELES COUNTY, 1988-2011



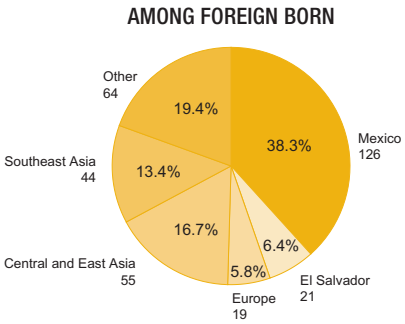
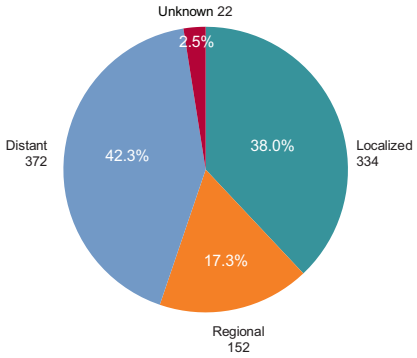


FIGURE 7. FREQUENCY DISTRIBUTION OF STAGE OF DISEASE FOR AYA CARCINOMA OF OVARY IN LOS ANGELES COUNTY, 1988-2011



TESTIS AND OVARIAN GERM CELL

Victoria Cortessis, PhD

Germ cells are the cells that develop before birth that become the eggs in girls' ovaries or the sperm in boys' testicles. The cells can become tumors in the ovaries or testicles and are usually diagnosed among AYAs. Rarely, during development of the embryo, these cells may also travel to other areas of the body and form a tumor. Germ cell tumors account for a small proportion of all ovarian cancers but over 90% of testicular cancer, and testicular germ cell tumors are the most common cancer of AYA males. Patterns of occurrence differ greatly between males and females, and may reflect the many possible sexual variations of ovary and testicular structure and function during development and reproductive life.

Undescended testis is associated with over four-fold increased risk of testicular germ cell tumors, which occurs among families to a far greater degree than do other common cancers. Inherited genetic traits associated explain only a small portion of this familial risk. Risk factors for ovarian germ cell tumors are not as well established, although hormonal factors have been suggested for both testicular and ovarian germ cell cancers.

RATES BY AGE, SEX AND TIME TRENDS

Testicular germ cell tumors are over ten times more common than ovarian germ cell tumors (Table 1). Testicular germ cell tumors have an unusual age pattern which begins to rise in adolescence, peaks in the 20's and declines thereafter (Figure 1). By contrast, ovarian germ cell tumor incidence drops steadily after adolescence. These patterns may be due to the fact that males continue to generate reproductive cells (sperm) whereas females do not generate additional eggs.

Age-adjusted incidence of testicular germ cell tumors rose steadily from 1988-1991 to 2007-2011, while incidence of ovarian germ cell tumors increased only slightly in this period (Figure 2). Incidence appears to rise more among the youngest set of AYA males (Figure 3a), while age patterns of ovarian cancer incidence are little changed (Figure 3b).

RATES BY RACE/ETHNICITY, SOCIOECONOMIC STATUS AND BIRTHPLACE

Race and ethnicity are important risk factors for testicular germ cell tumor risk. In 1988-2011 incidence is more than 5 times greater among non-Latino whites than among blacks, and the other racial/ethnic groups are in between. Little difference is seen for ovarian germ cell tumors between the three racial/ethnic groups among whom rates could be estimated (Table 2, Figure 4).

Among Latino and non-Latino whites there is a notable pattern of higher incidence of testicular germ cell tumors among those of higher SES. However, this pattern is not clearly apparent for testicular germ cell tumor incidence among other racial ethnic groups (Figure 5a), or for ovarian germ cell tumors (Figure 5b).

Although birthplace is unknown for 28% of cases, 31% of ovarian germ cell cancer cases and 19% of testicular germ cell tumor cases are reported to be foreign born, the majority in each group from Mexico or Central America. Greater proportions of testicular cases born in Europe (11% versus negligible) and ovarian cases born in Asia (22% versus 6%) correspond to race/ethnicity-specific incidence of testicular versus ovarian tumors (Figure 6).

RATES BY STAGE AT DIAGNOSIS

A higher proportion of testicular tumors (66%) than ovarian tumors (59%) are localized at the time of diagnosis, as could be expected due to the greater access of scrotal testis to physical inspection.

TABLE 1.
AGE-ADJUSTED INCIDENCE RATE BY AGE FOR AYA TESTIS AND OVARIAN GERM CELL IN LOS ANGELES COUNTY, 1988-2011

	Males		Females	
Age Group	N	AAIR (95%CI)	N	AAIR (95%CI)
15-24	1,067	5.8 (5.4–6.1)	197	1.2 (1.0–1.4)
25-34	2,168	11.0 (10.6–11.5)	123	0.6 (0.5–0.8)
35-39	859	9.5 (8.9–10.1)	28	0.3 (0.2–0.4)
All Ages 15-39	**4,094**	**8.6 (8.4–8.9)**	**348**	**0.8 (0.7–0.9)**

TABLE 2. AGE-ADJUSTED INCIDENCE RATE BY AGE AND RACE/ETHNICITY FOR AYA TESTIS AND OVARIAN GERM CELL IN LOS ANGELES COUNTY, 1988-2011

MALES								
	All Ages 15-24		All Ages 25-34		All Ages 35-39		All Ages 15-39	
Race/Ethnicity	N	AAIR (95%CI)	N	AAIR (95%CI)	N	AAIR (95%CI)	N	AAIR (95%CI)
Latino White	641	6.6 (6.1-7.1)	908	9.9 (9.2-10.5)	253	6.8 (6.0-7.7)	1,802	7.9 (7.5-8.3)
Black	20	1.2 (0.7-1.7)	52	3.1 (2.3-4.0)	33	4.0 (2.6-5.4)	105	2.6 (2.1-3.1)
Non-Latino White	350	7.7 (6.8-8.5)	1,073	17.4 (16.3-18.4)	517	16.2 (14.8-17.6)	1,940	13.3 (12.7-13.9)
Chinese	<20	—	26	4.2 (2.6-5.9)	<20	—	41	2.7 (1.8-3.5)
Japanese	<20	—	<20	—	<20	—	30	5.6 (3.6-7.6)
Filipino	<20	—	<20	—	<20	—	32	2.6 (1.7-3.5)
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotians	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—
FEMALES								
Latino White	112	1.4 (1.1-1.6)	62	0.7 (0.5-0.9)	<20	—	178	0.8 (0.7-1.0)
Black	<20	—	<20	—	<20	—	30	0.6 (0.4-0.9)
Non-Latino White	49	1.2 (0.8-1.5)	32	0.6 (0.4-0.8)	<20	—	91	0.7 (0.6-0.9)
Chinese	<20	—	<20	—	<20	—	<20	—
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	<20	—
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotians	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—

FIGURE 1. AGE-SPECIFIC RATE BY SEX FOR AYA TESTIS AND OVARIAN GERM CELL NEOPLASMS IN LOS ANGELES COUNTY, 1988-2011

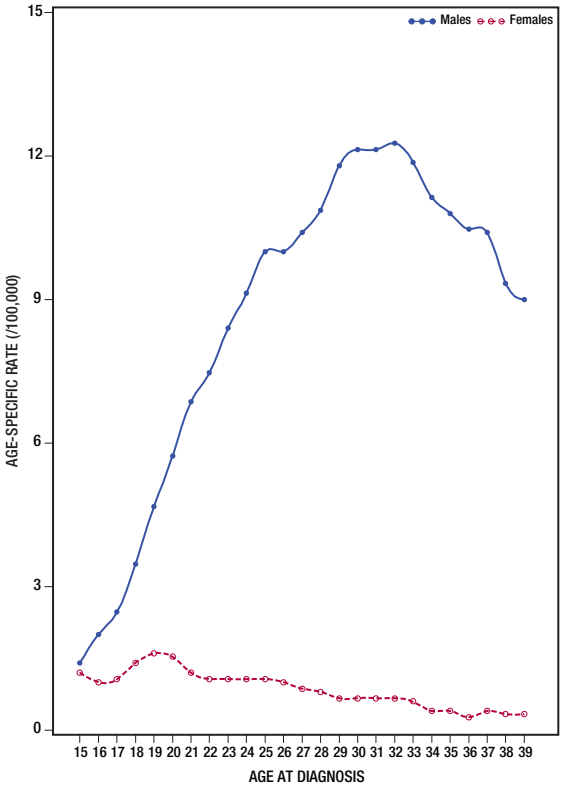


FIGURE 2. TREND IN AGE-ADJUSTED INCIDENCE RATE BY SEX FOR AYA TESTIS AND OVARIAN GERM CELL NEOPLASMS IN LOS ANGELES COUNTY, 1988-2011

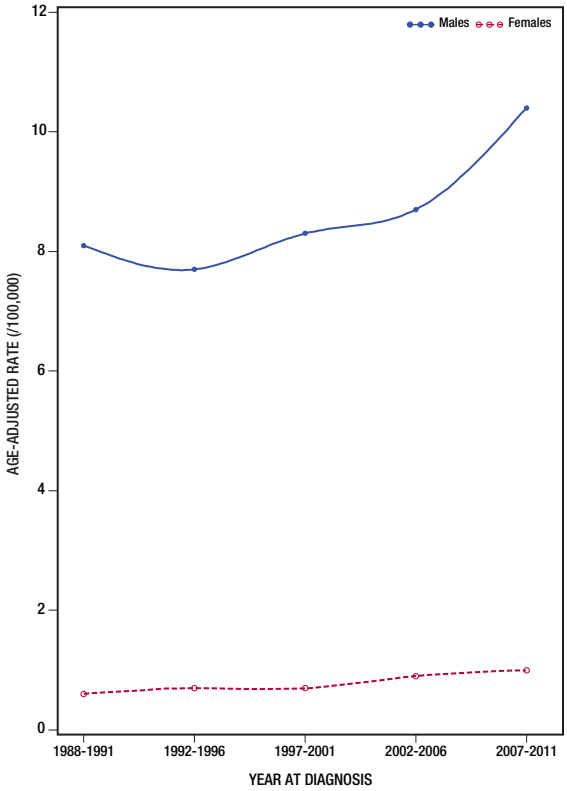


FIGURE 3. TREND IN AGE-SPECIFIC RATE BY SEX FOR AYA TESTIS AND OVARIAN GERM CELL NEOPLASMS IN LOS ANGELES COUNTY, 1988-2011

FIG 3(A): MALES

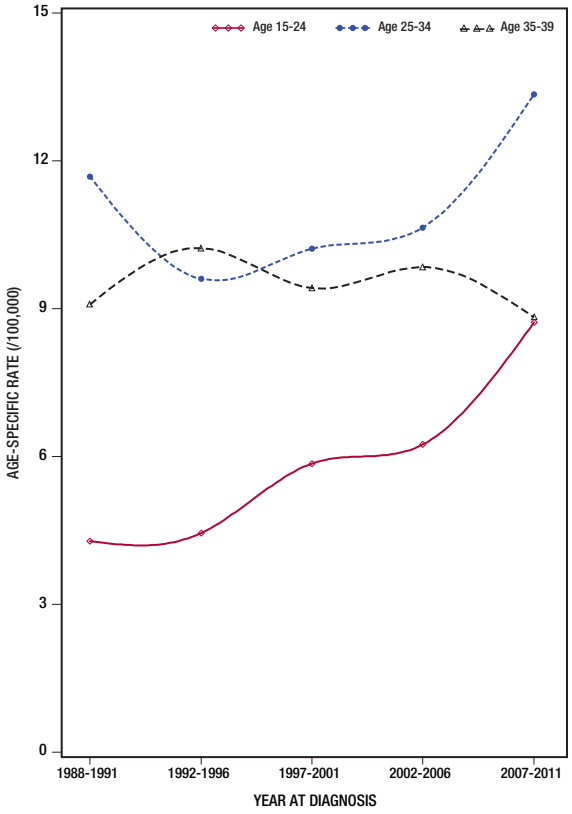


FIG 3(B): FEMALES

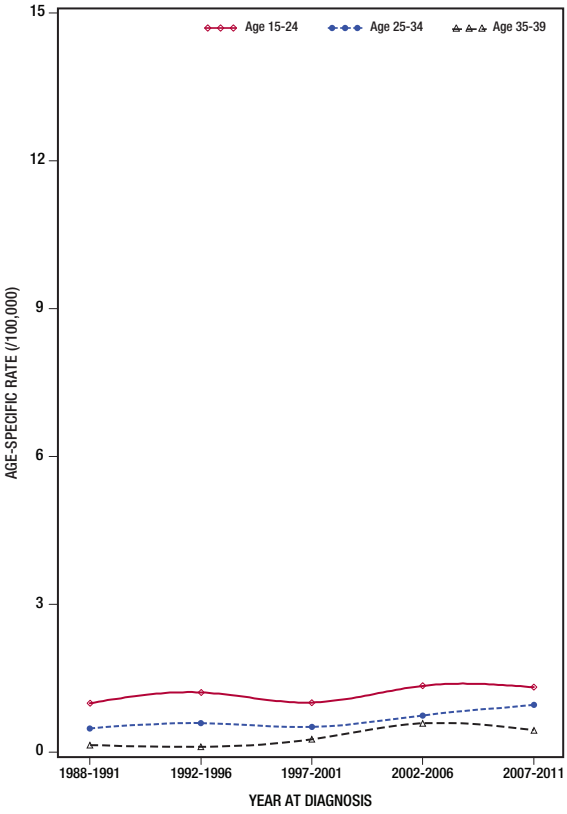


FIGURE 4. AGE-ADJUSTED INCIDENCE RATE BY RACE/ETHNICITY FOR AYA TESTIS AND OVARIAN GERM CELL IN LOS ANGELES COUNTY, 1988-2011

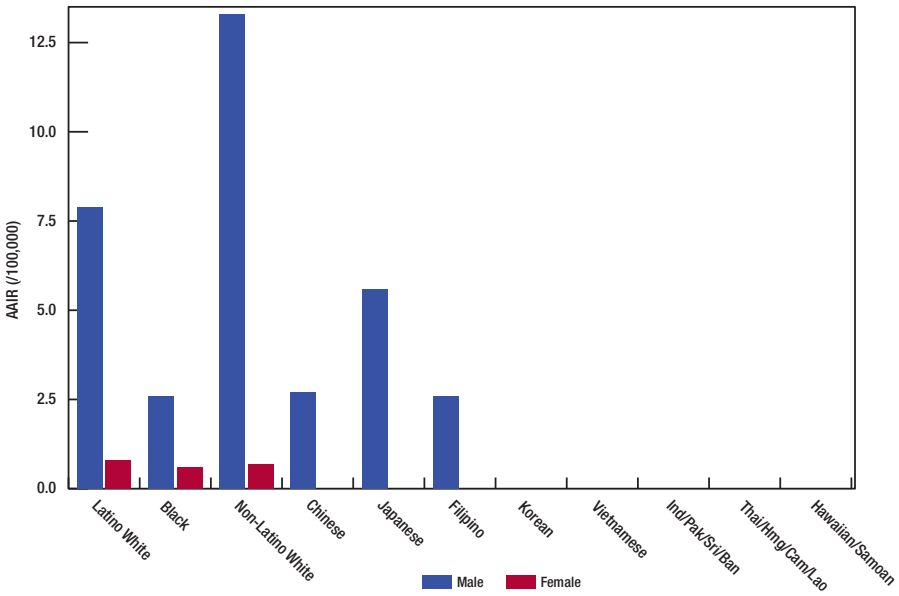


FIGURE 5. AGE-ADJUSTED INCIDENCE RATE BY SES BY RACE/ETHNICITY FOR AYA TESTIS AND OVARIAN GERM CELL IN LOS ANGELES COUNTY, 1988-2011

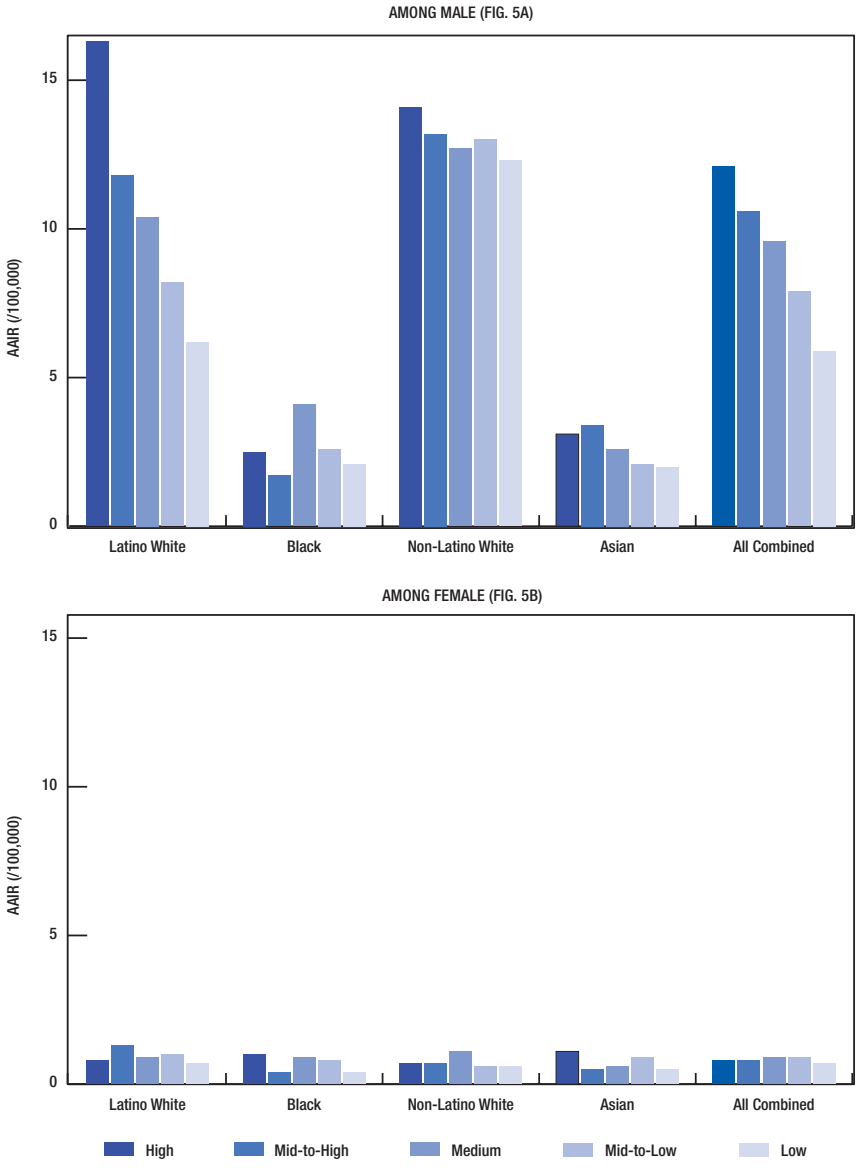
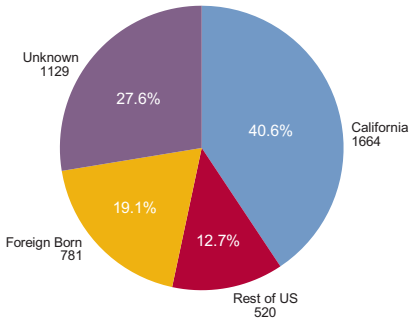
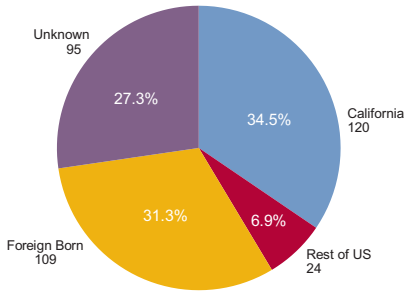


FIGURE 6. FREQUENCY DISTRIBUTION OF BIRTH PLACE FOR AYA TESTIS AND OVARIAN GERM CELL BY SEX IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 6A)

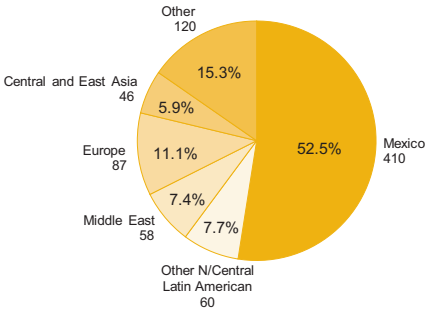


FEMALE (FIG. 6B)



AMONG FOREIGN BORN

MALE (FIG. 6C)



FEMALE (FIG. 6D)

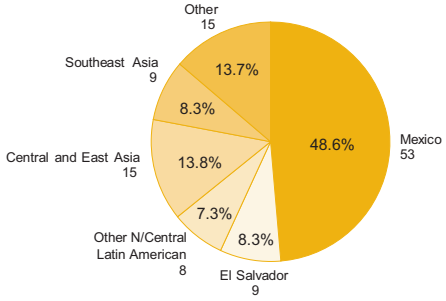
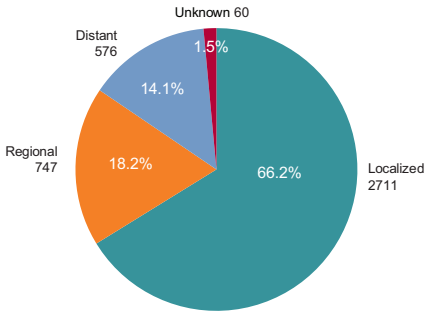
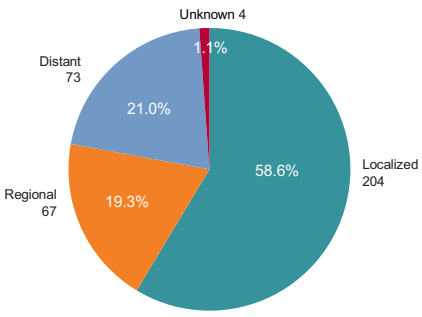


FIGURE 7. FREQUENCY DISTRIBUTION OF STAGE OF DISEASE BY SEX FOR AYA TESTIS AND OVARIAN GERM CELL IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 7A)



FEMALE (FIG. 7B)



THYROID

Melanie Goldfarb, MD

Well-differentiated thyroid cancer is increasing at a faster rate than any other cancer worldwide, growing by about 2½ times over the past 30 years. The most common subtype is papillary carcinoma and its variants, which account for close to 90% of all thyroid cancers, followed by follicular carcinoma, which accounts for about 5% of cases. Together, these two subtypes make up the well-differentiated thyroid cancers, named for their resemblance to normal aspects of thyroid tissue. Much, but not all of this increase is in small tumors less than 1 cm, especially in patients over 45 years of age. Most thyroid cancers are very slow growing and may be present for many years before they are detected.

Thyroid cancer is one of the five most common AYA malignancies in the U.S. and the second most common cancer in ages 20-39. In females, thyroid cancer is the most common cancer in ages 15-29 years and the second most common cancer for ages 30-39. Thyroid cancer currently has the second highest percent annual increase in cancer incidence of all AYA cancers in the U.S. It is unknown whether this increase is due to increased screening, biopsies, or other biologic, environmental, or ecologic factors.

Thyroid cancer is the only cancer where age at diagnosis has a recognized, significant impact on disease recurrence and survival. For this reason, age has been incorporated into the risk assessment scheme that clinicians use to make treatment decisions and relay information on cancer-specific prognosis to their patients. For the majority of AYA patients with primary thyroid cancer, long-term survival rates exceed 98%. The only proven risk factor for thyroid cancer is a history of head and neck radiation and is related to both dose of the radiation and age of the patient. Inherited tumor syndromes or a strong family history of thyroid cancer account for only a small percentage of the well-differentiated thyroid cancers, but probably a large percentage of medullary thyroid carcinoma in the AYA population, which is a cancer that arises from a different kind of thyroid cell.

Nearly 80% of thyroid cancers occur in females. However, males of all ages have an increased risk of thyroid cancer recurrence and a slightly worse survival. Additionally, blacks and other minority groups have slightly worse survival in some studies.

RATES BY AGE, SEX AND TIME TRENDS

In Los Angeles County, approximately 216 cases of thyroid cancer are diagnosed among AYAs each year. Incidence rates among females are higher than males for across all AYA age groups, similar to older adults. Between 1988 and 2011, the age-adjusted incidence rate of thyroid cancer is higher for females that it was for males (Table 1), with the numbers increasing with increasing age (Figure 1). Incidence rates increased in both males and females over the past decade, but at a greater rate in females compared to males (Figure 2) and in older AYAs compared to younger AYAs (Figure 3).

RATES BY RACE/ETHNICITY, SOCIOECONOMIC STATUS AND BIRTHPLACE

The highest thyroid cancer rates in Los Angeles County are in Filipinos, Vietnamese, non-Latino whites, and Latinos (Table 2 and Figure 4). For Latino and non-Latino whites there are moderate SES increases with higher rates of thyroid cancer in more affluent AYAs. However, in blacks and Asians the incidence rates are fairly equal across SES groups (Figure 5). In most populations, it tends to be found later among lower SES groups.

Although birthplace information is unavailable for approximately 26% of cases diagnosed in Los Angeles County, 44% of cases where data are available were born outside the U.S., mostly in Asia and Mexico (Figure 6). 71% of the U.S.-born cases were born in California.

RATES BY STAGE AT DIAGNOSIS

The majority of AYA thyroid cancers diagnosed in Los Angeles County have local or regional disease at diagnosis; only 3% of females and 5% of males have distant disease (Figure 7). Males present with a higher proportion of regional disease (43%) than females (34%). Additionally, the percentage of patients with regional disease decreases with increasing age (data not shown).

TABLE 1.
AGE-ADJUSTED INCIDENCE RATE BY AGE FOR AYA THYROID CARCINOMA IN LOS ANGELES COUNTY, 1988-2011

	Males		Females	
Age Group	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
15-24	143	0.8 (0.7–0.9)	745	4.3 (4.0–4.6)
25-34	466	2.4 (2.2–2.6)	2,127	11.4 (10.9–11.9)
35-39	317	3.5 (3.1–3.9)	1,384	15.5 (14.7–16.3)
All Ages 15-39	**926**	**2.0 (1.9–2.2)**	**4,256**	**9.6 (9.3–9.9)**

TABLE 2. AGE-ADJUSTED INCIDENCE RATE BY AGE AND RACE/ETHNICITY FOR AYA THYROID CARCINOMA IN LOS ANGELES COUNTY, 1988-2011

MALES								
	All Ages 15-24		**All Ages 25-34**		**All Ages 35-39**		**All Ages 15-39**	
Race/Ethnicity	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**	**N**	**AAIR (95%CI)**
Latino White	64	0.7 (0.5-0.8)	155	1.7 (1.5-2.0)	90	2.4 (1.9-2.9)	309	1.5 (1.3-1.6)
Black	<20	—	21	1.3 (0.7-1.8)	<20	—	38	0.9 (0.6-1.2)
Non-Latino White	56	1.2 (0.9-1.5)	213	3.5 (3.0-3.9)	167	5.2 (4.4-6.0)	436	3.0 (2.7-3.3)
Chinese	<20	—	<20	—	<20	—	26	1.7 (1.1-2.4)
Japanese	<20	—	<20	—	<20	—	<20	—
Filipino	<20	—	<20	—	<20	—	36	3.1 (2.1-4.1)
Korean	<20	—	<20	—	<20	—	<20	—
Vietnamese	<20	—	<20	—	<20	—	<20	—
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	<20	—
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	<20	—
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—
FEMALES								
Latino White	358	4.2 (3.8-4.7)	859	10.5 (9.8-11.2)	494	13.9 (12.6-15.1)	1,711	8.8 (8.4-9.2)
Black	26	1.4 (0.9-2.0)	75	3.9 (3.0-4.8)	72	7.5 (5.8-9.2)	173	3.8 (3.2-4.3)
Non-Latino White	274	6.2 (5.4-6.9)	842	14.8 (13.8-15.8)	572	19.4 (17.8-21.0)	1,688	12.5 (11.9-13.1)
Chinese	<20	—	67	9.8 (7.5-12.2)	51	13.9 (10.1-17.7)	131	7.7 (6.4-9.1)
Japanese	<20	—	<20	—	<20	—	32	5.2 (3.4-7.1)
Filipino	28	5.5 (3.5-7.6)	105	18.8 (15.2-22.3)	73	24.4 (18.8-29.9)	206	14.9 (12.8-16.9)
Korean	<20	—	44	10.8 (7.6-14.0)	28	13.6 (8.5-18.6)	83	8.6 (6.7-10.4)
Vietnamese	<20	—	27	15.6 (9.7-21.5)	26	29.8 (18.3-41.2)	61	14.7 (11.0-18.4)
Indian, Pakestani, Sri Lankan and Bangladeshi	<20	—	<20	—	<20	—	30	7.5 (4.8-10.3)
Thai, Hmong, Cambodian and Laotian	<20	—	<20	—	<20	—	21	7.2 (4.1-10.3)
Hawaiian and Samoan	<20	—	<20	—	<20	—	<20	—

FIGURE 1. AGE-SPECIFIC RATE BY SEX FOR AYA CARCINOMA OF THYROID IN LOS ANGELES COUNTY, 1988-2011

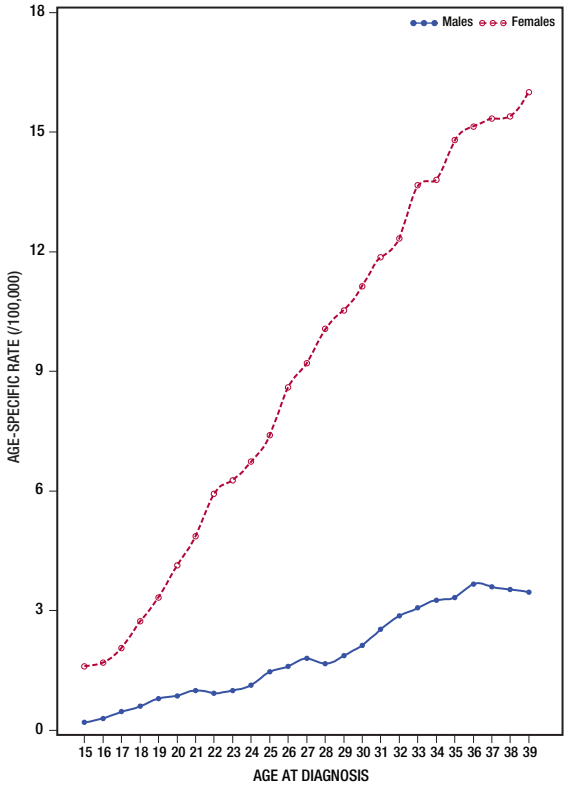


FIGURE 2. TREND IN AGE-ADJUSTED INCIDENCE RATE BY SEX FOR AYA CARCINOMA OF THYROID IN LOS ANGELES COUNTY, 1988-2011

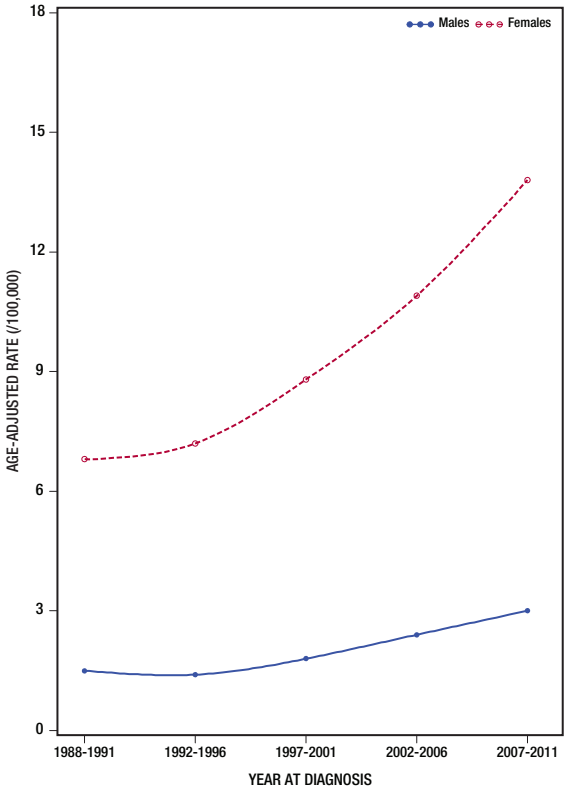


FIGURE 3. TREND IN AGE-SPECIFIC RATE BY SEX FOR AYA CARCINOMA OF THYROID IN LOS ANGELES COUNTY, 1988-2011

FIG 3(A): MALES

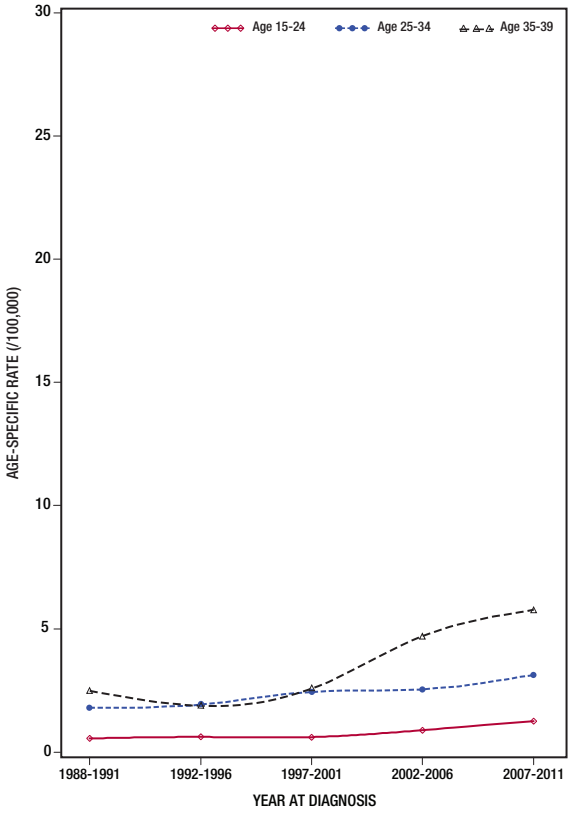


FIG 3(B): FEMALES

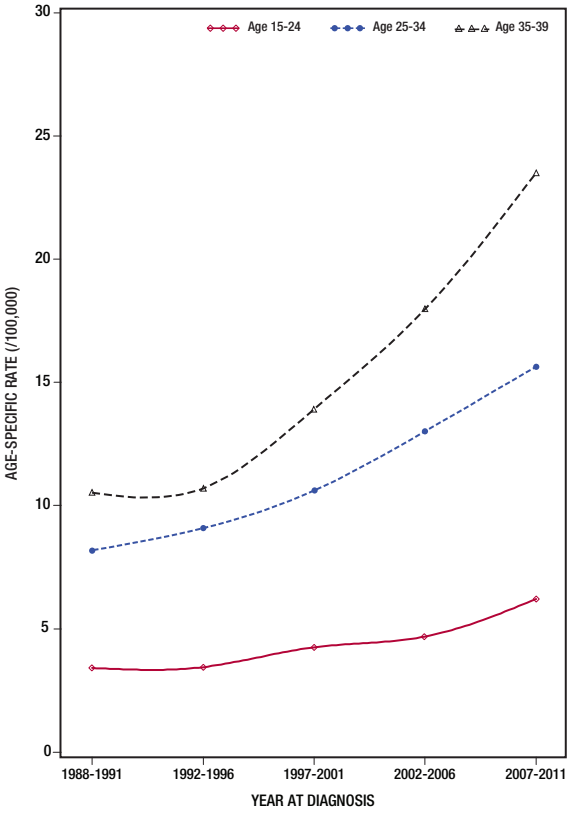


FIGURE 4. AGE-ADJUSTED INCIDENCE RATE BY RACE/ETHNICITY FOR AYA THYROID CARCINOMA IN LOS ANGELES COUNTY, 1988-2011

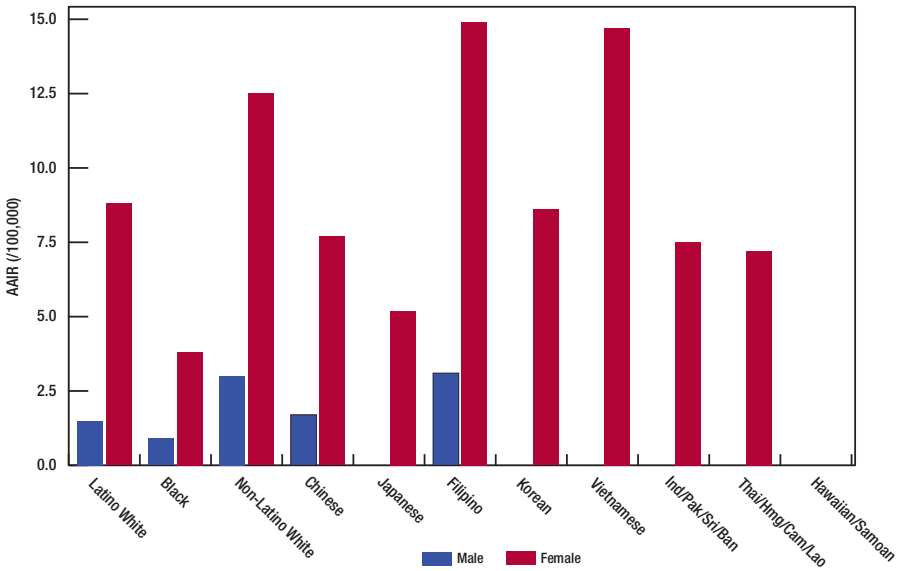


FIGURE 5. AGE-ADJUSTED INCIDENCE RATE BY SES BY RACE/ETHNICITY FOR AYA THYROID CARCINOMA IN LOS ANGELES COUNTY, 1988-2011

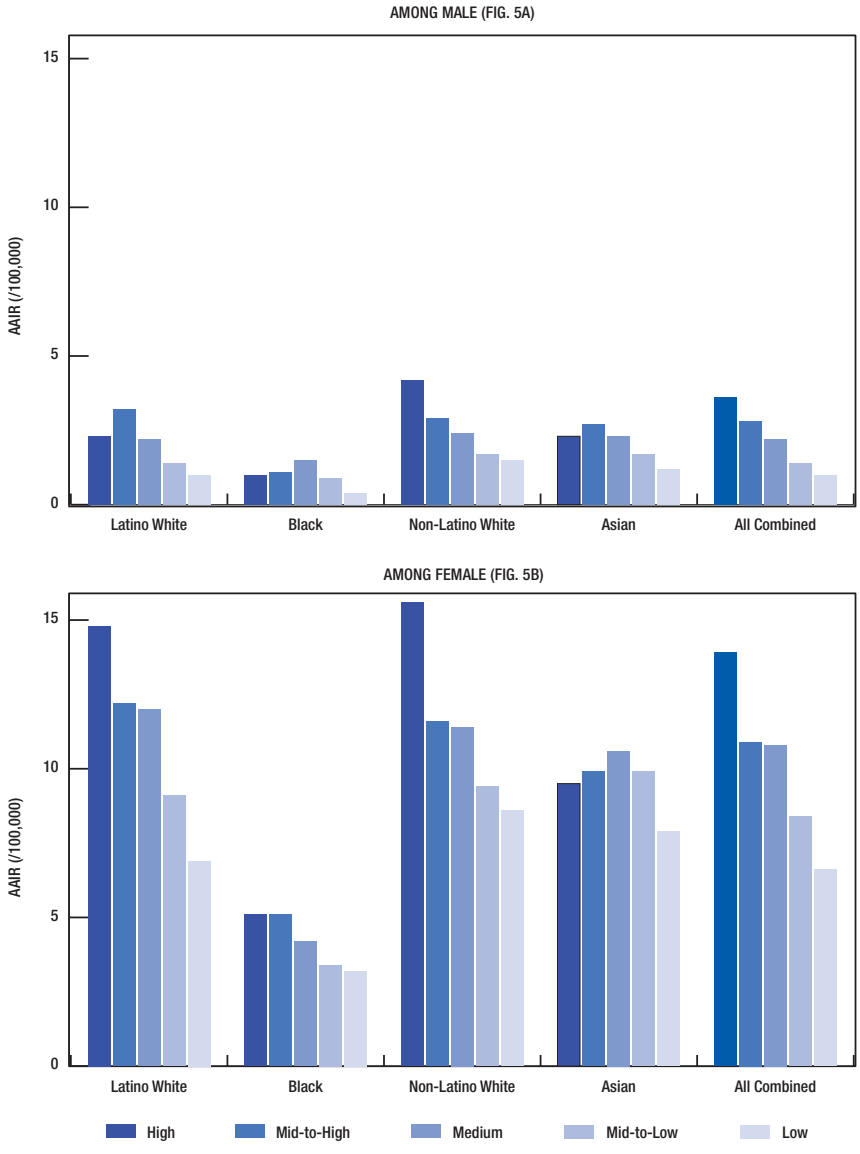
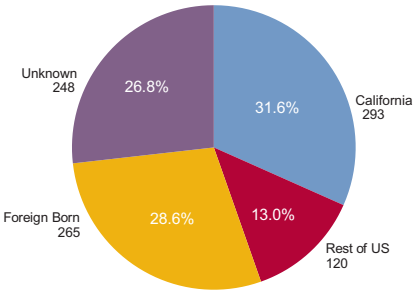
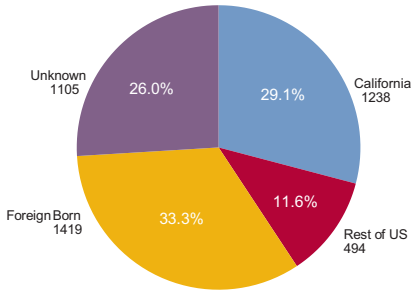


FIGURE 6. FREQUENCY DISTRIBUTION OF BIRTH PLACE FOR AYA THYROID CARCINOMA BY SEX IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 6A)

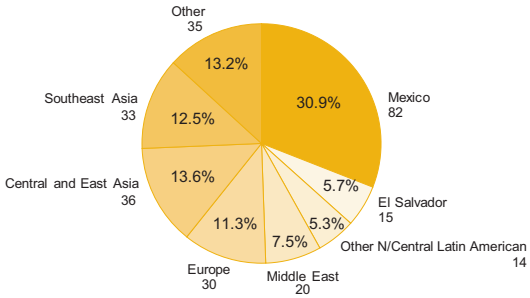


FEMALE (FIG. 6B)



AMONG FOREIGN BORN

MALE (FIG. 6C)



FEMALE (FIG. 6D)

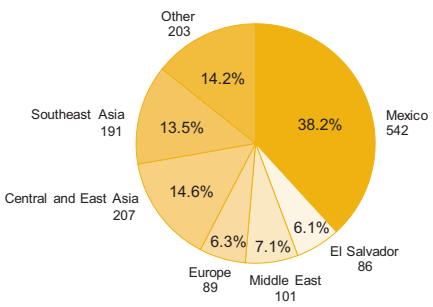
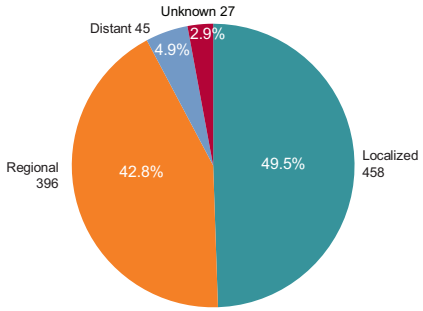
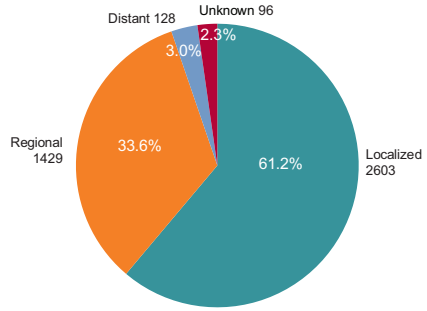


FIGURE 7. FREQUENCY DISTRIBUTION OF STAGE OF DISEASE BY SEX FOR AYA THYROID CARCINOMA IN LOS ANGELES COUNTY, 1988-2011

MALE (FIG. 7A)



FEMALE (FIG. 7B)



APPENDIX A: DETAILED METHODS

DETERMINATION OF RACE/ETHNICITY OF CANCER PATIENTS

Race/ethnicity and Spanish/Latino origin of cancer patients are submitted to the CSP by reporting hospitals and physicians with information in the medical records and use of Spanish/Latino surnames. Based on the reported information, the CSP recodes the race/ethnicity into mutually exclusive groups to facilitate research and surveillance purposes. In this monograph, cancer patients were classified into the mutually exclusive racial/ethnic groups of: non-Latino white, Latino white, black, Chinese, Japanese, Filipino, Korean, Vietnamese, South Asian (including Asian Indian, Pakistani, Sri Lankan, and Bangladeshi), Thai/Hmong/Cambodian/Laotian, Hawaiian/Samoan, and Other. Due to the small numbers and high heterogeneity of the group, data for Other race/ethnicity are not presented in this monograph. Patients with unknown race/ethnicity (less than 5% of total cases) are excluded from race/ethnicity-specific analysis, but included in the all races combined.

ESTIMATING SOCIOECONOMIC STATUS

Because hospitals and physicians do not collect individual patients' socioeconomic status (SES) information, the CSP uses the neighborhoods' SES indicators to estimate the cancer patients' SES to detect any relationship with specific cancer outcomes. For the period of 1988-2011, the CSP SES measurement was based on 1990 census results for Los Angeles County at census tract level for cancer cases diagnosed during 1988-1995, 2000 census data at the census block group level for cases of 1996-2005, and American Community Survey (ACS) 2006-2010 5-year estimates at census block group level for cases diagnosed during 2006-2011. From each census or ACS database, median household income and average educational attainment for residents aged 25 years and older were used respectively to rank all the census tracts or census block groups. The combined ranking scores at each census geographic level were ranked again by quintiles representing five SES groups from high (SES=1) to low (SES=5). Individual cancer patients were assigned the SES value of their neighborhood at the time of diagnosis.

PLACE OF BIRTH

We categorized patient's place of birth as U.S. born in California, U.S. born outside California, foreign-born and unknown. Among foreign born patients, birthplace was further categorized as Mexico, El Salvador, Other North/Central Latin America, South Latin America, Middle East, Europe, Canada, Pacific Islands, Central and East Asia, South Asia, Southeast Asia, Caribbean Islands, Africa, Australia/New Zealand. Countries with less than 5% of the total cases were coded as 'OTHER' in pie charts to better visualize.

POPULATION DENOMINATORS

To calculate cancer incidence rates, annual population estimates as denominators are needed. The population estimates for Los Angeles County during 1988-2011 by age, sex, and race/ethnicity came from the CSP annual population estimates. The estimates were based on linear interpolation of census results between censuses for intercensal years (i.e., 1970-1980, 1980-1990, 1990-2000, 2000-2010). However, due to unavailability of information for some small racial/ethnic groups in the 1980 census, the 1988 and 1989 population estimates for Vietnamese, South Asian, Thai/Hmong/Cambodian/Laotian, and Hawaiian/Samoan followed the 1990-2000 population trends of these groups.

TECHNICAL TERMS

Age-adjusted rate: The age-adjusted rate is a weighted average of the age-specific rates in standard 5-year intervals in three age categories: 15 to 24, 25 to 34 and 35 to 39 years, where the weights represent the age distribution of a standard population. Rates in this report are age-adjusted by the direct method to the 2000 U.S. population, and are calculated per 100,000 persons. Age-adjustment allows meaningful comparisons of cancer rates by controlling for differences in the age distribution of two populations, which can profoundly affect cancer rates. The age-adjusted rate is calculated as:

$$A.A.R. = \sum_{i=0-4}^{85+} (w_i r_i)$$

where *A.A.R.* represents the age-adjusted rate, w_i is the proportion of age group i in the standard population, and r_i is the Los Angeles County age-specific rate for the age group.

For each cancer site, age-adjusted rates are shown in Table 1 (age-adjusted incidence rates for 3 age groups (15-24, 25-34, 35-39) and for all AYA ages combined), Table 2 (age-adjusted incidence rates by age groups and race/ethnicity), Figure 2 (trends in age-adjusted incidence rates by sex in 5-year time periods (1988-1991, 1992-1996, 1997-2001, 2002-2006, 2007-2011) except for Kaposi's Sarcoma in time periods of (1988-1991, 1992-1995, 1996-2000, 2001-2005, 2006-2011), Figure 4 (graphs of incidence rates by race/ethnicity for all ages combined) and Figure 5 (graphs of incidence rates by socioeconomic status by race/ethnicity (Latino white, black, non-Latino white and Asians).

Age-specific rate: The age-specific rate is calculated by dividing the total number of cases in a specific age group by the total population in that age group. This rate is then multiplied by 100,000 to yield an age-specific rate per 100,000 population. The age-specific rate is calculated as:

$$r_i = \left(\frac{c_i}{n_i} \right)$$

where r_i is the age-specific rate for age group i, c_i is the count of cases for that age group, and n_i is the count of persons at risk (i.e., the population) for that age group.

For each cancer site, age-specific rates are shown in Figure 1 (single year age-specific rates were calculated and converted to a 3 year moving average) and Figure 3 (three age-specific rates (ages 15-24, 25-34, 35-39).

Data suppression: As discussed in Materials and Methods, rates based on small numbers of cases may not be statistically reliable. Rates in Tables 1, 2 and Figure 4 are not shown (suppressed) when the number of cases was less than 20.

CALCULATION OF RATES AND TRENDS IN RATES

We collapsed data into one 4-year and four 5-year time periods (1988-1991, 1992-1996, 1997-2001, 2002-2006, 2007-2011) to show changes over time and to obtain meaningful estimates for rare cancers.

APPENDIX B: LIST OF AYA CANCER SITE NAME AND AYA SITE RECODE

CHAPTER TITLE	AYA SITE RECODE NAME	AYA SITE RECODE
Bone and Other Soft Tissue	Osteosarcoma Ewing Tumor Other Soft Tissue Sarcoma-excl Kaposi Sarcoma	17 19 23
Brain and Central Nervous System	Specified Low-Grade Astrocytoma Glioblastoma and Anaplastic Astrocytoma Astrocytoma NOS Other Glioma Other Specified Intracranial and Intraspinal Neoplasms All Brain and Central Nervous System Combined	07 08 09 10 14 07-16
Breast	Carcinoma of Breast	36
Cervix and Uterus	Carcinoma of Cervix and Uterus Carcinoma of Cervix Carcinoma of Uteri	40 40 (restricted site2 to '530'-'539') 40 (restricted site2 to '540'-'559')
Colorectal	Carcinoma of Colon and Rectum	42
Lip, Oral Cavity and Pharynx	Other Sites in Lip Oral Cavity and Pharynx	33
Kaposi's Sarcoma	Kaposi Sarcoma	24
Leukemia	Acute Lymphoid Leukemia Acute Myeloid Leukemia	01 02
Lymphoma	Hodgkin Lymphoma Non-Hodgkin Lymphoma	06 05
Melanoma	Melanoma	29
Ovary	Carcinoma of Ovary	39
Testis and Ovarian Germ Cell	Germ Cell and Trophoblastic Neoplasms of Gonads	26
Thyroid	Thyroid Carcinoma	31

APPENDIX C: SEER AYA SITE RECODE

SITE GROUP	ICD-O-3 BEHAVIOR RECODE	PRIMARY SITE	ICD-O-3 HISTOLOGY	RECODE
1 Leukemias				
1.1 Acute lymphoid leukemia	3	C000-C809	9826, 9835-9836	01
	3	C420-C421, C424	9811-9818, 9837	01
1.2 Acute myeloid leukemia	3	C000-C809	9840, 9861, 9865-9867, 9869, 9871-9874, 9891, 9895-9898, 9910-9911, 9920	02
1.3 Chronic myeloid leukemia	3	C000-C809	9863, 9875-9876, 9945-9946	03
1.4 Other and unspecified leukemia	3	C000-C809	9742, 9800-9801, 9805-9809, 9820, 9831-9834, 9860, 9870, 9930-9931, 9940, 9948, 9963-9964	04
	3	C420-C421,C424	9823, 9827	04
2 Lymphomas				
2.1 Non-Hodgkin lymphoma	3	C000-C809	9590-9591, 9596-9597, 9670-9671, 9673, 9675, 9678-9680, 9684, 9687-9691, 9695, 9698-9702, 9705, 9708-9709, 9712, 9714, 9716-9719, 9725-9729, 9735, 9737-9738	05
	3	C000-C419,C422-C423,C425-C809	9811-9818, 9823, 9827, 9837	05
2.2 Hodgkin lymphoma	3	C000-C809	9650-9655, 9659, 9661-9665, 9667	06
3 CNS and Other Intracranial and Intraspinal Neoplasms (all behaviors)				
3.1. Astrocytoma				
3.1.1 Specified low-grade astrocytic tumors	0, 1, 3	C723	9380	07
	0, 1, 3	C000-C809	9410-9411, 9420-9421, 9424	07
3.1.2 Glioblastoma and anaplastic astrocytoma	0, 1, 3	C000-C809	9401, 9440-9442	08
3.1.3 Astrocytoma, NOS	0, 1, 3	C000-C809	9400	09
3.2 Other glioma	0, 1, 3	C000-C722, C724-C809	9380	10
	0, 1, 3	C000-C809	9381-9384, 9423, 9430, 9450-9451, 9460	10
3.3 Ependymoma	0, 1, 3	C000-C809	9391-9394	11
3.4. Medulloblastoma and other PNET				
3.4.1 Medulloblastoma	0, 1, 3	C716	9470-9474	12
3.4.2 Supratentorial PNET	0, 1, 3	C000-C715, C717-C809	9470-9474	13

SITE GROUP	ICD-O-3 BEHAVIOR RECODE	PRIMARY SITE	ICD-O-3 HISTOLOGY	RECODE
3 CNS and Other Intracranial and Intraspinal Neoplasms (all behaviors) *continued*				
3.5 Other specified intracranial and intraspinal neoplasms	0, 1, 3	C000-C699, C730-C750, C754-C809	9350-9351, 9360-9362, 9390, 9480, 9530-9535, 9537-9539, 9541, 9550, 9562, 9570	14
	0, 1, 3	C700-C729, C751-C753	9161, 9361-9362, 9390, 9530-9531, 9535, 9538, 9540, 9560, 9571	14
	0, 1, 3	C700	9532, 9534, 9537, 9539	14
	0, 1, 3	C753	9360	14
	0, 1, 3	C711	9480, 9539	14
	0, 1, 3	C713	9480, 9533	14
	0, 1, 3	C719	9350	14
	0, 1, 3	C714,C717	9480	14
	0, 1, 3	C709	9539	14
3.6 Unspecified intracranial and intraspinal neoplasms				
3.6.1 Unspecified malignant intracranial and intraspinal neoplasms	3	C700-C729, C751-C753	8000-8005	15
3.6.2 Unspec. ben/border intracran. and intraspin. Neo.	0, 1	C700-C729, C751-C753	8000-8005	16
4 Osseous & Chondromatous Neoplasms				
4.1 Osteosarcoma	3	C000-C809	9180-9187, 9192-9194	17
4.2 Chondrosarcoma	3	C000-C809	9220-9221, 9230-9231, 9240, 9242-9243	18
4.3 Ewing tumor	3	C000-C809	9260, 9364-9365	19
4.4 Other specified and unspecified bone tumors	3	C000-C809	8812, 9250, 9261, 9370-9372	20
	3	C400-C419	8000-8005, 8800-8803, 8805-8806, 9200	20
5 Soft Tissue Sarcomas				
5.1 Fibromatous neoplasms	3	C000-C809	8810-8811, 8813-8815, 8820-8824, 8830, 8832-8833, 8835-8836, 9252	21
5.2 Rhabdomyosarcoma	3	C000-C809	8900-8904, 8910, 8912, 8920-8921, 8991	22
5.3 Other soft tissue sarcoma				
5.3.1 Specified soft tissue sarcoma				
5.3.1.1 Specified (excluding Kaposi sarcoma)	3	C000-C809	8804, 8825, 8840-8897, 8982-8983, 8990, 9040-9044, 9120-9139, 9141-9150, 9170, 9251, 9561, 9580-9581	23
	3	C000-C699,C730-C750,C754-C809	9540, 9560, 9571	23

SITE GROUP	ICD-O-3 BEHAVIOR RECODE	PRIMARY SITE	ICD-O-3 HISTOLOGY	RECODE
5 Soft Tissue Sarcomas *continued*				
5.3.1.2 Kaposi sarcoma	3	C000-C809	9140	24
5.3.2 Unspecified soft tissue sarcoma	3	C000-C399, C420-C809	8800-8803, 8805-8806	25
6 Germ Cell and Trophoblastic Neoplasms				
6.1 Germ cell and trophoblastic neoplasms of gonads	3	C569, C620-C629	9060-9065, 9070-9073, 9080-9085, 9090-9091, 9100-9102, 9105	26
6.2 Germ cell and trophoblastic neoplasms of nongonadal sites				
6.2.1 Intracranial (all behaviors)	0, 1, 3	C700-C729, C751-C753	9060-9065, 9070-9073, 9080-9085, 9090-9091, 9100-9102, 9105	27
6.2.2 Other nongonadal	3	C000-C568, C570-C619, C630-C699, C730-C750, C754-C809	9060-9065, 9070-9073, 9080-9085, 9090-9091, 9100-9102, 9104-9105	28
7 Melanoma and Skin Carcinomas				
7.1 Melanoma	3	C000-C809	8720-8723, 8726, 8728, 8730, 8740-8746, 8761, 8770-8774, 8780	29
7.2 Skin carcinomas	3	C440-C449	8010-8589	30
8 Carcinomas				
8.1 Thyroid carcinoma	3	C739	8010-8589	31
8.2 Other carcinoma of head and neck				
8.2.1 Nasopharyngeal carcinoma	3	C110-C119	8010-8589	32
8.2.2 Other sites in lip, oral cavity and pharynx	3	C000-C109, C120-C148	8010-8589	33
8.2.3 Nasal cav,mid ear, sinuses, larynx,oth illdef head/neck	3	C300-C329,C760	8010-8589	34
8.3 Carcinoma of trachea,bronchus, and lung	3	C330-C349	8010-8589	35
8.4 Carcinoma of breast	3	C500-C509	8010-8589	36
8.5 Carcinoma of genitourinary tract				
8.5.1 Carcinoma of kidney	3	C649	8010-8589	37
8.5.2 Carcinoma of bladder	3	C670-C679	8010-8589	38
8.5.3 Carcinoma of gonads	3	C569, C620-C629	8010-8589	39
	3	C000-C809	8590-8593	39
8.5.4 Carcinoma of cervix and uterus	3	C530-C559	8010-8589	40
8.5.5 Carc of other and ill-def sites, geniourinary tract	3	C510-C529, C570-C579, C600-C619, C630-C639, C659, C669, C680-C689	8010-8589	41

SITE GROUP	ICD-O-3 BEHAVIOR RECODE	PRIMARY SITE	ICD-O-3 HISTOLOGY	RECODE
8 Carcinomas *continued*				
8.6 Carcinoma of gastrointestinal tract				
8.6.1 Carcinoma of colon and rectum	3	C180-C218	8010-8589	42
8.6.2 Carcinoma of stomach	3	C160-C169	8010-8589	43
8.6.3 Carcinoma of liver and intrahepatic bile ducts	3	C220-C221	8010-8589	44
8.6.4 Carcinoma of pancreas	3	C250-C259	8010-8589	45
8.6.5 Carc other and ill-def sites, gastrointestinal tract	3	C150-C159, C170-C179, C230-C249, C260-C269	8010-8589	46
8.7 Carcinoma of other and ill-def sites				
8.7.1 Adrenocortical carcinoma	3	C740-C749	8010-8589	47
8.7.2 Carcinoma of other and ill-defined sites, NOS	3	C149,C219, C222-C229, C270-C299, C350-C439, C450-C499, C561-C568, C580-C599, C640-C648, C650-C658, C660-C668, C690-C738, C750-C759, C761-C809	8010-8589	48
	3	C809	9010	48
9 Miscellaneous specified neoplasms, NOS				
9.1 Other pediatric and embryonal tumors, NOS				
9.1.1 Wilms tumor	3	C000-C809	8959-8960	49
9.1.2 Neuroblastoma	3	C000-C809	9490, 9500	50
9.1.3 Other pediatric and embryonal tumors, NOS	3	C000-C809	8963-8964, 8970-8973, 8981, 9363, 9501-9523	51
9.2 Other specified and embryonal tumors, NOS				
9.2.1 Paraganglioma and glomus tumors	3	C000-C809	8680-8711	52
9.2.2 Other specified gonadal tumors	3	C000-C809	8600-8650, 9000	53
	3	C569	8670, 9013-9015, 9054	53
9.2.3 Myeloma, mast cell, misc. lymphoreticular neo., NOS	3	C000-C809	9724, 9731-9734, 9740-9741, 9743-9764, 9766, 9769, 9960, 9965-9967, 9970-9971	54

SITE GROUP	ICD-O-3 BEHAVIOR RECODE	PRIMARY SITE	ICD-O-3 HISTOLOGY	RECODE
9 Miscellaneous specified neoplasms, NOS *continued*				
9.2.4 Other specified neoplasms, NOS	3	C000-C809	8930-8951, 8980, 9020, 9050-9053, 9110, 9160, 9270-9330, 9950, 9961-9962, 9975, 9980, 9982, 9989, 9991-9992	55
	3	C000-C699, C730-C750, C754-C809	9161	55
10 Unspecified Malignant Neoplasms				
10 Unspecified Malignant Neoplasms	3	C000-C399, C420-C699, C730-C750, C754-C809	8000-8005	56
Unclassified				99

AYA Site Recode ICD-O-3/WHO 2008 Definition*^
The information provided in this table is also available in an ASCII text file (semicolons are used as the delimiters). To see how this variable is used with SEER data and the other AYA variable definition, see the AYA Site Recode home page.

* This table was updated for Hematopoietic codes based on WHO Classification of Tumours of Haematopoietic and Lymphoid Tissues (2008).
^ Subject to change based on evolving ICD-O-3 coding rules.
AYA Site Recode ICD-O-3/WHO 2008 http://www.seer.cancer.gov/ayarecode/aya-who2008.html 6/26/2013

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Keck Medicine of USC

LOS ANGELES CANCER SURVEILLANCE PROGRAM AND AYA@USC