An Evaluation of Cancer Occurrence in Carlsbad, California, 1996-2008

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Executive Summary

Background: Carlsbad is a coastal city located in northern San Diego County, California, with a population of approximately 107,000 persons. The San Diego County Health and Human Services Agency asked the California Department of Public Health (CDPH), California Cancer Registry (CCR) to evaluate selected cancers in Carlsbad due to concerns about a perceived excess of cancer cases among community members, especially children, related to two schools in Carlsbad and the Encina Power Station. According to community members, many homes and schools in the community were built on land that was used for farming in the past, and residents were concerned about possible pesticide and heavy metal contamination in the soil and water as a result of the agricultural use. In addition, residents raised concerns about air contamination related to output from the Encina Power Station.

Methods: CCR used its standard methodology to determine if the number of cancer cases reported was significantly different from the number of cases that would be expected for a similar population group in terms of age, sex, and race/ethnicity distribution within the census tracts that Carlsbad comprises. CCR used the census tract (CT) as a basis for this analysis because the U.S. Census Bureau provides the best estimate of the population characteristics, which are necessary for an epidemiologic analysis. Based on incidence rates for California, and accounting for age, sex, and race/ethnicity, CCR calculated the number of new cancers that might be expected to occur in Carlsbad. We compared this number to the actual number of new, invasive cancer cases in Carlsbad that were collected by CCR, using the Poisson distribution as a model for statistical variation. The analysis included the 23 CTs that include parts of the city of Carlsbad. We analyzed the three CTs closest to the Encina Power Station (178.05, 178.06, and 178.11) individually. We also analyzed the three CTs that include Kelly Elementary School (178.10), Carlsbad High School (178.01) and the CT between the schools (178.09) individually, because these two schools were identified as sites of concern within the community. The analysis examined the occurrence of all forms of cancer by site, among all racial groups combined, and for three age groups (0-14 years, 15-19 years, and 20 years and older). The analysis included cancer cases collected by CCR during the years 1996 through 2008, the latest year for which CCR data are accurate and complete. In addition, we reviewed and verified a list of cancer cases collected and submitted by Carlsbad community members to determine if the cases were part of the CCR database. If we could not verify a case, we documented the reasons.

Results: Between 1996-2008, 8,090 residents of the 23 CTs that include portions of Carlsbad were newly diagnosed with an invasive cancer. In Carlsbad, 9,132 new cases of cancer were expected during the same time period when the city of Carlsbad was compared with the overall California population (plausible range of cases = 7,860 – 8,325). Thus, the overall number of new cancer cases in Carlsbad was lower than what would be expected for this 13-year period. By type, cancers of the breast, prostate, and lung were the three most common cancers observed in Carlsbad. However, the

numbers of breast, prostate, and lung cancers detected in the Carlsbad CTs were lower than what would be expected when compared with the overall California population.

In each of the three CTs closest to the Encina Power Station and in the two CTs containing schools of concern, the number of observed new cases of cancer was not significantly higher than what would be expected for any of the specific cancer sites reviewed. In CT 178.09, which is between the two schools, there were 201 new cases of cancer diagnosed between 1996-2008. In this area, about 162 new cancer cases were expected during the same period (plausible range of cases = 166 – 241). Further analyses showed that the increased number of cases occurred only among women aged 20 years and older, and that there were no specific cancers with a higher number of cases than expected in this CT. This observed pattern is more consistent with the statistical variation that can occur when multiple comparisons are made, (as in this analysis, in which more than 20 cancer sites were examined in six CTs and for Carlsbad as a whole), as opposed to an indicator of increased cancer risk.

In the Carlsbad area covered by all 23 CTs, 695 new cases of malignant melanoma of the skin were diagnosed between 1996 and 2008. In this area, 416 cases of melanoma were expected during the same time period when the city of Carlsbad was compared to the overall California population (plausible range of cases = 629 – 766). Further analyses showed that the increase over time in melanoma cases in Carlsbad was consistent with the increases experienced in San Diego County as a whole and in California.

Conclusions: The results from this study show no elevation of cancer overall in the city of Carlsbad as a whole, the three CTs closest to the Encina Power Station, and the two CTS that included schools of concern. We observed an elevation of malignant melanoma, consistent with the experience of San Diego County overall. One CT (178.09) had a higher than expected number of new cancer cases, but further review showed expected counts were only elevated in one segment of the population (women aged 20 years and older) with no elevation of any specific cancer type, a finding most consistent with statistical variation. Other than an elevation of malignant melanoma, patterns of cancer in Carlsbad were similar to patterns in the rest of San Diego County and California. CCR will continue to monitor the area, but there are no findings that indicate the need for further investigation at this time.

Background

Carlsbad is a coastal city located in northern San Diego County, California with a population of approximately 107,000 persons, of which 78 percent are Caucasian, 13 percent are Hispanic or Latino, 5 percent are Asian and 1 percent are Black or African American (City of Carlsbad website, 2010). According to reports from Carlsbad residents, many areas of the city were built on former farmland. The Encina Power Station is located on the Pacific coast within Carlsbad and is an electricity-generating plant that has been in operation since 1954. Plans for a new desalination plant and electrical station are under development for the current site of the Encina Power Station.

The California Department of Public Health (CDPH), California Cancer Registry (CCR) is a statewide, population-based cancer surveillance system. In 1985, California Health and Safety Code Sections 103875, 103885, and 100330 mandated statewide population-based cancer reporting. Statewide cancer reporting was fully implemented in 1988. As of 2010, CCR has collected detailed information on more than 3.4 million cases of cancer, with approximately 162,000 new cases added each year. CCR collects information on almost all cancers diagnosed in California, with the exception of squamous and basal cell carcinomas of the skin. Health care facilities and providers must report cancer cases to CCR within six months of diagnosis. CCR ensures that cancer reporting in California is complete, timely, and accurate by working with reporting facilities to make sure that cancer cases are submitted and by actively seeking out cases that may not have been reported.

The San Diego County Health and Human Services Agency asked CCR to evaluate the occurrence of selected cancers in Carlsbad due to concerns about a possible excess of cancer cases related to two schools in Carlsbad and in areas near the Encina Power Station. The schools of concern are Kelly Elementary School and Carlsbad High School. Concerns related to Kelly Elementary School focus on possible contamination from residual pesticides and heavy metals in the soil.

Methods

In accordance with standard methods developed by CCR we calculated Standardized Incidence Ratios to evaluate the number of new cancers that might be expected to occur for the population in the area of interest for this cancer concern based on incidence rates for California, and accounting for age, sex, and race/ethnicity. We compared this number with the actual number of new, invasive cancer cases in the area of interest that were collected by CCR, using the Poisson distribution as a model for statistical variation. Using this analysis we determined if the number of cases reported (observed) was significantly different from the number of cases that would be expected for a similar population group in terms of age, sex, and race/ethnicity distribution. The range of cases that would be consistent with the number of observed cases was determined from the 99 percent confidence limits, based on the Poisson distribution. In

this report, we refer to this as “the plausible range of cases.” We included all cases of cancer that were collected by CCR as of April 2010 in this review. If the expected number of cases fell within the plausible range of cases, we concluded that the number of cases observed does not represent a cancer excess. If the expected number of cases did not fall within the range of plausible cases, we reviewed the information to determine if the findings were due to chance (statistical variation) or to a true cancer case excess or reduction.

In conducting cancer evaluations, it is the policy of CCR to examine cancer occurrence for a particular area at the census tract (CT) level. This is to ensure the privacy and confidentiality of cancer patients in the area by maintaining the geographic area included in the analysis at a high enough level to prevent the identification of individual patients, and to use the official census population counts that are available on an age-, race-, and sex-specific level. In this report, the 23 CTs which include parts of the city of Carlsbad will be referred to as “Carlsbad” (see map, Figure 2). A total of six CTs were examined individually to address community concerns. We analyzed three tracts associated with the Encina Power Station (178.05, 178.06, and 178.11) individually. In addition, we analyzed the three CTs that include Kelly Elementary School (178.10), Carlsbad High School (178.01) and the CT between the schools (178.09) individually.

The number of observed and expected cases were compared for all major cancer sites during the years 1996-2008, the latest year for which the CCR data are considered complete. We chose this 13-year time-period of observation because the geocoding of cancer cases (i.e., the process of accurately assigning the geographic location of residence to each cancer case) was considered reliable during this time period and less reliable prior to 1996. In addition, we compared cancers in three age groups: 0-14 years, 15-19 years, and 20 years and older. This analysis provided a review of cancer among children in the Carlsbad area since concerns were raised by community members about cancers among children who attended Kelly Elementary School.

We used, two sources of population data for the Carlsbad analysis because of the time period during which this analysis was conducted. We used population counts from the U.S. Census Bureau to analyze the cancer data for the years 1996-2004, since this time period was closest to the 2000 Census. We used population estimates generated by San Diego County for the years 2005-2008 because of known population growth in the Carlsbad area since the 2000 Census. According to the U.S. Census website, the population of Carlsbad was 78,247 in 2000, and was estimated to be 98,000 in 2009 (U.S. Census Bureau, 2009). The official City of Carlsbad website estimates that the population of Carlsbad is 107,000 (City of Carlsbad, 2010).

California law (Health and Safety Code Section 103885) requires that reports that contain CCR data not identify any individual cases. CCR guidelines require that for a geographic area with a small population, the minimum number of incident cases reported for a specific cancer site shall be five. Therefore, in this report, we report any cancer case counts of one, two, three, or four as a count of less than five.

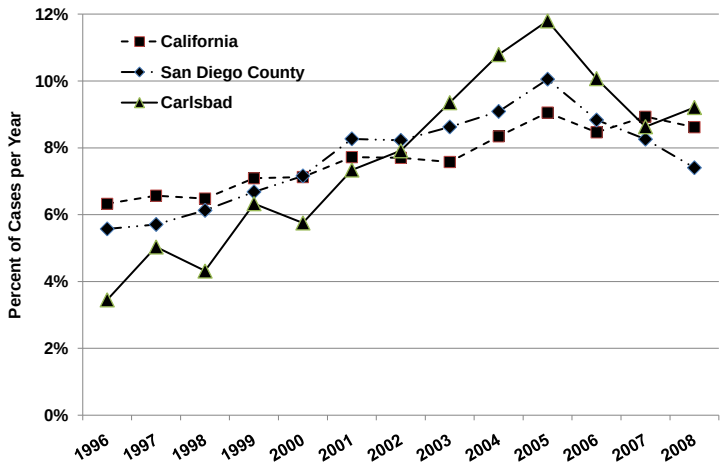
In addition to the standard quantitative analysis, CCR reviewed and verified cancer cases collected and submitted by Carlsbad community members. For this analysis, CCR used all available information about the cases to determine if the cases had been collected by CCR and were a part of the CCR database. If a case could not be verified within the CCR database, we documented the reasons. A summary of this review is also provided in this report.

Results

Quantitative Evaluation

Between 1996-2008, 8,090 Carlsbad residents were newly diagnosed with cancer. If the 23 CTs that include areas of Carlsbad experienced the same rate of cancer as California as a whole, 9,132 cancers would be expected to occur in the same time period (plausible range of cases = 7,860 – 8,325). This indicates somewhat less cancer in the area than might be anticipated. Table 1 shows the observed and expected cases for the most common cancer sites for all races and all ages in the Carlsbad area. For these cancer sites, the only statistically significant cancer excess we identified was for malignant melanoma of the skin. CCR collected reports of 695 new cases of malignant melanoma of the skin for this 23 CT area during 1996-2008. During this time period, 416 melanoma cases were expected (plausible range of cases = 629 – 766). An in-depth review of these cases revealed that all 695 invasive melanoma cases occurred among adults aged 20 years and older. For these cases, 279 (40 percent) were diagnosed among women and 416 (60 percent) were diagnosed among men. This distribution is consistent with the distribution observed in San Diego County and in California as a whole during the same time period. A comparison of the percent of total melanoma cases diagnosed per year during the time period 1996-2008 for Carlsbad, San Diego County, and California shows that there has been an increase in the number of new melanoma cases in all three areas during the time period reviewed (Figure 1). These data indicate that the increased incidence of melanoma observed in Carlsbad is consistent with both county and statewide trends.

Figure 1. Percent per Year of Number of New Malignant Melanoma of the Skin Cases Diagnosed during 1996-2008 – Carlsbad, San Diego County, and California



Source: California Cancer Registry

Tables 2 through 7 show the number of new cancers collected by CCR during 1996-2008 by cancer site for CTs 178.01, 178.05, 178.06, 178.09, 178.10 and 178.11. The only CT with an excess of new cancer cases overall was CT 178.09, which is the CT between Carlsbad High School and Kelly Elementary School (Table 5). In CT 178.09, we observed 201 new cancer cases during 1996-2008. During this time period, 162 new cancer cases were expected (plausible range of cases = 166 - 241). An in-depth review of these cases revealed that the excess cancers occurred only among women aged 20 years and older and was for all cancer sites combined. We did not identify any excess for any individual cancer site. This pattern is more consistent with statistical variation that can occur when multiple comparisons are made (as in this analysis) as opposed to an indicator of increased cancer risk.

We analyzed new cancer cases in Carlsbad among three age groups: 0-14 years, 15-19 years, and 20 years and older. We conducted this analysis to address community concerns related to cancers among children who attended Kelly Elementary School and Carlsbad High School. During 1996-2008, CCR collected 65 new cancer cases among children aged 0-19 years in the 23 CTs that include areas of Carlsbad (Table 8). There was no excess of new cancer cases among children in Carlsbad during this time period. For each cancer site and age group, the number of new cases observed was within the range of cases that would be expected for a similar group based on the CCR analysis.

Community-Reported Case Verification

In May 2010, Carlsbad community members submitted five lists containing information they collected about cancer cases in their community for verification against the CCR database. The lists contained information about 323 individuals. Initial review of these lists determined that there were 253 unique human cases included on this list. Of these cases, 94 were verified within the CCR database and 159 were not (Table 9). Table 10 shows the reasons that the 159 cases could not be verified in the CCR database. Of the 159 cases, 126 did not have sufficient information, such as name, date of birth, or address to allow verification. To confirm a case, CCR must be able to match the information provided against the information in its database. A total of 19 cases were not cancers, 9 were cases that were diagnosed in 2009 or 2010 for which reports were not yet received by CCR, 3 were cases that were diagnosed when the individual was not a California resident, and 2 were diagnosed prior to 1988, the year CCR began collecting data. For the nine cases diagnosed in 2009 or 2010, subsequent review of the information revealed that five of these nine cases did not include a last name and therefore did not have sufficient information to allow the case to be verified within the CCR database. The other four cases were all diagnosed within late 2009 or 2010 and were not yet reported to the CCR at the time we conducted this analysis.

Discussion and Conclusions

This analysis identified an excess of cases of malignant melanoma of the skin in the Carlsbad area. The excess of melanoma cases in Carlsbad is consistent with an observed increase in new melanoma cases in California and the United States (California Cancer Facts and Figures, 2010; National Cancer Institute, 2009). The distribution of melanoma cases in Carlsbad was similar to that of San Diego County in terms of age at diagnosis and sex.

The leading risk factor for developing melanoma is sun exposure. Other risk factors include a family history of skin cancer or melanoma, blonde or red hair and light-colored skin, having more than 50 nevi (moles), having dysplastic nevi, and a history of intense exposure to sunlight or severe sunburns early in life. Individuals with a weakened immune system such as persons who have received an organ transplant or who have been infected with human immunodeficiency virus (HIV) are also at increased risk for developing melanoma (National Cancer Institute, 2009).

Persons may reduce their risk for developing melanoma by avoiding sun exposure during the hours of 10 A.M. to 4 P.M.; wearing protective clothing such as long-sleeved shirts, long pants, and wide-brimmed hats; using sunscreen with an SPF of 30 or higher and a wide spectrum of coverage; and wearing sunglasses with ultraviolet (UV) light-absorbing lenses (National Cancer Institute, 2009).

We identified a slight excess of cancer cases in CT 178.09, the tract that is located between the CTs that contain Carlsbad High School and Kelly Elementary School. This

excess was limited to women aged 20 years and older and was for all cancers combined. No individual cancer site had a significant excess of cancer cases in this tract. An excess of this type could be due to statistical variations that can occur when multiple analyses are run on the same data. With multiple comparisons, there is a high likelihood that there will be a few statistically significant findings that do not indicate the presence of a true excess of cancer cases. Because the excess of cases was very small and was not linked to any specific cancer site, this finding does not indicate a cancer cluster.

Any analysis of this type has inherent limitations. Small numbers, such as those in this analysis, are associated with unstable statistics. A second limitation is related to the time period for this analysis. Because this analysis included cases that were diagnosed up to eight years after the 2000 census, the census population counts we used to estimate the number of cases expected were no longer reliable. Changes in the size of the total population of a geographic area will affect the number of expected cancer cases for that area. According to the U.S. Census website, the population of Carlsbad was 78,247 in 2000 and was estimated to be 98,000 in 2009. The City of Carlsbad website estimates that the population of Carlsbad is 107,000. For this analysis we used two sources of population data to account for known changes in the size of the Carlsbad population. We used population counts from the U.S. Census Bureau to analyze the cancer data for 1996-2004 since this time period was closest to the 2000 Census. We used population estimates generated by San Diego County for 2005-2008 because of known population growth in the Carlsbad area since the 2000 Census.

A third limitation of this analysis is that it included only cases diagnosed through the end of 2008. We could not include cases diagnosed during 2009 and 2010 because of the time necessary for CCR to receive, verify, and compile accurate information about cancer cases in California. Most cancer cases are reported to CCR within 12 months of diagnosis. After CCR receives initial information about a case, cancer registrars review the information and subject it to rigorous quality control mechanisms in compliance with state and national cancer reporting standards. Registrars also check case information against existing information in the CCR database to determine if the case is new or is already in the database. CCR also receives information from other states about cancer cases diagnosed in California residents. Finally, about 10 percent of cancer cases are now diagnosed and treated solely in outpatient health care facilities and in doctors' offices. These cases are often harder to find and require considerable time and effort to obtain accurate information. This process requires about 18 months to complete, and CCR releases its data for analysis only when it has received at least 95 percent of the expected cases.

CCR data are mostly abstracted from medical records. These records include the address where the person lived when he or she was diagnosed with cancer, but no information is available about the length of time that the person lived at that address. Because cancers typically develop over a long period of time, the address or area where a person lived when he or she was diagnosed with cancer may not be the same location where he or she lived when exposed to one or more risk factors that may have

contributed to the development of cancer. This makes it difficult to ascertain what potential exposures in a person's environment, if any, may have contributed to the development of cancer.

Most cancers have more than one risk factor that can lead to their development, and it is likely that many risk factors contribute to the development of a new cancer. Thus, even if a cancer excess is identified within a community, it may not be possible to identify any specific cause for that excess because many different factors may have contributed to the development of the cancers. Obtaining sufficient information on the many different factors that can contribute to the development of a cancer can be very difficult.

Finally, as we see in this analysis, a cancer excess can be due to chance alone and not any specific exposure or risk factor. This is often the case when the identified excess is small, as we see in CT 178.09. When multiple statistical comparisons are made as part of an analysis, the likelihood increases that a statistically significant finding will occur solely because so many comparisons. However, when an excess is large (e.g., eight or nine times greater than what is expected), is identified for a specific cancer site, and that cancer site is related to a risk factor known to exist within the area, then the excess is more likely to represent a true increase in risk and would require further investigation.

In conclusion, cancer is a serious public health issue in Carlsbad, California, as it is in San Diego County, California, and the United States. More than two out of five Californians will be diagnosed with a cancer during their lifetime, and more than one in five Californians will die from a cancer. Cancer is a group of many complex diseases with multiple risk factors, and it is very difficult to determine the precise cause or combination of causes for most cancers. In Carlsbad, there is an excess of melanoma cases that is consistent with both state and national trends. The identification of this excess provides an opportunity for the Carlsbad community to increase awareness about melanoma risk factors and to implement measures that can help to prevent its development. Based on the findings documented in this report, CCR will continue to monitor the area, but there is no need for further investigation into the occurrence of cancers in Carlsbad at this time.

References

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Table 1: Numbers of New (Incident) Cancer Cases in 23 Census Tracts within Carlsbad, California, with Expected Numbers for Similar Groups[1] and Range of Plausible Numbers of New Cases,[2] Diagnoses during 1996-2008

Cancer Site	New Cases Observed 1996-2008	Expected Cases for Similar Groups[3]	Range of Plausible Numbers of New Cases [2,3]	
			Smallest	Largest
All sites combined	8090	9132	7860	8325
Brain and Central Nervous System	113	127	88	143
Breast (female)	1341	1480	1249	1438
Cervix	51	77	35	72
Colon and Rectum	733	991	665	806
Esophagus	71	89	51	96
Kaposi Sarcoma	6	15	2	16
Kidney and Renal Pelvis	201	209	166	241
Larynx	51	65	35	72
Acute Lymphocytic Leukemia	15	25	7	28
Chronic Lymphocytic Leukemia	76	73	55	102
Acute Myeloid Leukemia	60	74	42	83
Chronic Myeloid Leukemia	25	30	14	41
Hodgkin Lymphoma	40	45	26	59
Non-Hodgkin Lymphoma	316	372	272	365
Liver and Intrahepatic Bile Duct	78	100	57	104
Lung and Bronchus	943	1249	866	1025
Melanoma of the Skin[4]	695	416	629	766
Myeloma	87	95	65	114
Oral Cavity and Pharynx	191	215	157	230
Pancreas	192	215	158	231
Prostate	1211	1330	1123	1304
Soft Tissue (Sarcoma)	72	55	52	97
Testis	54	50	37	76
Thyroid	137	125	109	170
Urinary Bladder	364	447	317	416
Uterus	182	247	149	220

California Cancer Registry Data as of April 2010

1. Based on incidence rates for California, 1996-2008, by age, sex, and race/ethnicity
2. 99% confidence limits around the observed from Poisson methods
3. Numbers are rounded to the nearest whole number
4. Statistically significant finding based on confidence limits

Table 2: Numbers of New (Incident) Cancer Cases for Census Tract 178.01, Carlsbad, California, with Expected Numbers for Similar Groups[1] and Range of Plausible Numbers of New Cases,[2] Diagnoses during 1996-2008

Cancer Site	New Cases Observed 1996-2008	Expected Cases for Similar Groups[3]	Range of Plausible Numbers of New Cases [2,3]	
			Smallest	Largest
All sites combined	359	433	312	411
Brain and Central Nervous System	7	6	2	17
Breast (female)	62	69	44	85
Cervix	<5	4	0	11
Colon and Rectum	26	46	15	42
Esophagus	<5	4	0	11
Kaposi Sarcoma	<5	1	0	5
Kidney and Renal Pelvis	6	10	2	16
Larynx	<5	3	0	9
Acute Lymphocytic Leukemia	<5	1	0	9
Chronic Lymphocytic Leukemia	5	3	1	14
Acute Myeloid Leukemia	<5	4	0	11
Chronic Myeloid Leukemia	<5	1	0	7
Hodgkin Lymphoma	<5	3	0	9
Non-Hodgkin Lymphoma	14	18	6	27
Liver and Intrahepatic Bile Duct	5	5	1	14
Lung and Bronchus	36	59	22	55
Melanoma of the Skin	28	21	16	45
Myeloma	<5	4	0	9
Oral Cavity and Pharynx	9	10	3	20
Pancreas	13	10	6	26
Prostate	58	65	40	81
Soft Tissue (Sarcoma)	<5	3	1	13
Testis	<5	3	1	13
Thyroid	9	6	3	20
Urinary Bladder	9	21	3	20
Uterus	16	11	8	30

California Cancer Registry Data as of April 2010

1. Based on Incidence Rates for California, 1996-2008, by age, sex and race/ethnicity
2. 99% confidence limits around the observed from Poisson methods
3. Numbers are rounded to the nearest whole number

Table 3: Numbers of New (Incident) Cancer Cases for Census Tract 178.05, Carlsbad, California, with Expected Numbers for Similar Groups[1] and Range of Plausible Numbers of New Cases,[2] Diagnoses during 1996-2008

Cancer Site	New Cases Observed 1996-2008	Expected Cases for Similar Groups[3]	Range of Plausible Numbers of New Cases [2,3]	
			Smallest	Largest
All sites combined	354	416	307	405
Brain and Central Nervous System	<5	5	0	11
Breast (female)	51	62	35	72
Cervix	<5	2	0	7
Colon and Rectum	34	49	21	52
Esophagus	<5	4	0	11
Kaposi Sarcoma	<5	1	0	5
Kidney and Renal Pelvis	13	9	6	26
Larynx	<5	3	0	11
Acute Lymphocytic Leukemia	<5	1	0	7
Chronic Lymphocytic Leukemia	<5	4	0	11
Acute Myeloid Leukemia	5	3	1	14
Chronic Myeloid Leukemia	<5	1	0	7
Hodgkin Lymphoma	<5	1	0	9
Non-Hodgkin Lymphoma	17	17	8	31
Liver and Intrahepatic Bile Duct	5	4	1	14
Lung and Bronchus	46	62	30	67
Melanoma of the Skin	17	17	8	31
Myeloma	<5	5	1	13
Oral Cavity and Pharynx	12	9	5	24
Pancreas	10	11	4	21
Prostate	48	63	32	69
Soft Tissue (Sarcoma)	6	2	2	16
Testis	<5	1	0	7
Thyroid	<5	4	1	13
Urinary Bladder	14	23	6	27
Uterus	<5	11	1	13

California Cancer Registry Data as of April 2010

1. Based on Incidence Rates for California, 1996-2008, by age, sex and race/ethnicity
2. 99% confidence limits around the observed from Poisson methods
3. Numbers are rounded to the nearest whole number

Table 4: Numbers of New (Incident) Cancer Cases for Census Tract 178.06, Carlsbad, California, with Expected Numbers for Similar Groups[1] and Range of Plausible Numbers of New Cases,[2] Diagnoses during 1996-2008

Cancer Site	New Cases Observed 1996-2008	Expected Cases for Similar Groups[3]	Range of Plausible Numbers of New Cases [2,3]	
			Smallest	Largest
All sites combined	86	137	64	113
Brain and Central Nervous System	<5	2	0	5
Breast (female)	8	18	3	19
Cervix	<5	1	0	5
Colon and Rectum	8	16	3	19
Esophagus	<5	1	0	5
Kaposi Sarcoma	<5	0	0	5
Kidney and Renal Pelvis	5	3	1	14
Larynx	<5	1	0	5
Acute Lymphocytic Leukemia	<5	0	0	5
Chronic Lymphocytic Leukemia	<5	1	0	7
Acute Myeloid Leukemia	<5	1	0	7
Chronic Myeloid Leukemia	<5	1	0	7
Hodgkin Lymphoma	<5	1	0	9
Non-Hodgkin Lymphoma	<5	6	0	11
Liver and Intrahepatic Bile Duct	<5	1	0	5
Lung and Bronchus	10	20	4	21
Melanoma of the Skin	9	6	3	20
Myeloma	<5	2	0	7
Oral Cavity and Pharynx	<5	3	0	7
Pancreas	<5	4	1	13
Prostate	9	22	3	20
Soft Tissue (Sarcoma)	<5	1	1	13
Testis	<5	1	0	7
Thyroid	<5	1	0	9
Urinary Bladder	<5	8	0	11
Uterus	<5	3	0	9

California Cancer Registry Data as of April 2010

1. Based on Incidence Rates for California, 1996-2008, by age, sex and race/ethnicity
2. 99% confidence limits around the observed from Poisson methods
3. Numbers are rounded to the nearest whole number

Table 5: Numbers of New (Incident) Cancer Cases for Census Tract 178.09, Carlsbad, California, with Expected Numbers for Similar Groups[1] and Range of Plausible Numbers of New Cases,[2] Diagnoses during 1996-2008

Cancer Site	New Cases Observed 1996-2008	Expected Cases for Similar Groups[3]	Range of Plausible Numbers of New Cases [2,3]	
			Smallest	Largest
All sites combined[4]	201	162	166	241
Brain and Central Nervous System	<5	2	0	11
Breast (female)	39	26	25	58
Cervix	<5	1	0	9
Colon and Rectum	20	17	10	35
Esophagus	<5	2	1	13
Kaposi Sarcoma	<5	0	0	5
Kidney and Renal Pelvis	6	4	2	16
Larynx	<5	1	0	7
Acute Lymphocytic Leukemia	<5	0	0	5
Chronic Lymphocytic Leukemia	<5	1	0	11
Acute Myeloid Leukemia	<5	1	0	5
Chronic Myeloid Leukemia	<5	1	0	7
Hodgkin Lymphoma	<5	1	0	5
Non-Hodgkin Lymphoma	9	7	3	20
Liver and Intrahepatic Bile Duct	<5	2	0	7
Lung and Bronchus	24	22	13	40
Melanoma of the Skin	11	8	4	23
Myeloma	<5	2	0	11
Oral Cavity and Pharynx	5	4	1	14
Pancreas	<5	4	0	7
Prostate	25	24	14	41
Soft Tissue (Sarcoma)	<5	1	0	5
Testis	<5	1	0	7
Thyroid	<5	2	0	11
Urinary Bladder	<5	8	0	9
Uterus	6	4	2	16

California Cancer Registry Data as of April 2010

1. Based on Incidence Rates for California, 1996-2008, by age, sex and race/ethnicity
2. 99% confidence limits around the observed from Poisson methods
3. Numbers are rounded to the nearest whole number
4. Statistically significant based on confidence limits

Table 6: Numbers of New (Incident) Cancer Cases for Census Tract 178.10, Carlsbad, California, with Expected Numbers for Similar Groups[1] and Range of Plausible Numbers of New Cases,[2] Diagnoses during 1996-2008

Cancer Site	New Cases Observed 1996-2008	Expected Cases for Similar Groups[3]	Range of Plausible Numbers of New Cases [2,3]	
			Smallest	Largest
All sites combined	373	428	325	426
Brain and Central Nervous System	7	6	2	17
Breast (female)	53	67	36	75
Cervix	<5	3	0	7
Colon and Rectum	30	45	18	47
Esophagus	<5	4	0	9
Kaposi Sarcoma	<5	1	0	9
Kidney and Renal Pelvis	7	10	2	17
Larynx	<5	3	1	13
Acute Lymphocytic Leukemia	<5	1	0	5
Chronic Lymphocytic Leukemia	<5	3	1	13
Acute Myeloid Leukemia	<5	3	0	5
Chronic Myeloid Leukemia	<5	1	0	9
Hodgkin Lymphoma	<5	2	0	7
Non-Hodgkin Lymphoma	15	17	7	28
Liver and Intrahepatic Bile Duct	<5	5	0	11
Lung and Bronchus	60	60	42	83
Melanoma of the Skin	25	20	14	41
Myeloma	<5	4	0	9
Oral Cavity and Pharynx	5	10	1	14
Pancreas	11	10	4	23
Prostate	65	69	46	89
Soft Tissue (Sarcoma)	<5	2	0	9
Testis	<5	2	0	5
Thyroid	6	5	2	16
Urinary Bladder	23	21	13	39
Uterus	5	11	1	14

California Cancer Registry Data as of April 2010

1. Based on Incidence Rates for California, 1996-2008, by age, sex and race/ethnicity
2. 99% confidence limits around the observed from Poisson methods
3. Numbers are rounded to the nearest whole number

Table 7: Numbers of New (Incident) Cancer Cases for Census Tract 178.11, Carlsbad, California, with Expected Numbers for Similar Groups[1] and Range of Plausible Numbers of New Cases,[2] Diagnoses during 1996-2008

Cancer Site	New Cases Observed 1996-2008	Expected Cases for Similar Groups[3]	Range of Plausible Numbers of New Cases [2,3]	
			Smallest	Largest
All sites combined	388	458	339	442
Brain and Central Nervous System	6	6	2	16
Breast (female)	58	79	40	81
Cervix	<5	4	0	9
Colon and Rectum	36	49	22	55
Esophagus	<5	4	0	5
Kaposi Sarcoma	<5	1	0	5
Kidney and Renal Pelvis	15	10	7	28
Larynx	<5	3	0	9
Acute Lymphocytic Leukemia	<5	1	0	9
Chronic Lymphocytic Leukemia	<5	4	1	13
Acute Myeloid Leukemia	<5	4	1	13
Chronic Myeloid Leukemia	<5	2	0	7
Hodgkin Lymphoma	<5	2	0	11
Non-Hodgkin Lymphoma	15	19	7	28
Liver and Intrahepatic Bile Duct	<5	5	0	9
Lung and Bronchus	47	63	31	68
Melanoma of the Skin	34	21	21	52
Myeloma	<5	5	0	7
Oral Cavity and Pharynx	8	11	3	19
Pancreas	6	11	2	16
Prostate	67	63	48	91
Soft Tissue (Sarcoma)	<5	3	1	13
Testis	<5	3	0	11
Thyroid	7	6	2	17
Urinary Bladder	17	22	8	31
Uterus	5	13	1	14

California Cancer Registry Data as of April 2010

1. Based on Incidence Rates for California, 1996-2008, by age, sex and race/ethnicity
2. 99% confidence limits around the observed from Poisson methods
3. Numbers are rounded to the nearest whole number

Table 8: Numbers of New (Incident) Cancer Cases among Children Aged 0 to 19 Years in Carlsbad, with Expected Numbers for Similar Groups[1] and Range of Plausible Numbers of New Cases,[2] Diagnoses during 1996-2008

Cancer Site and Age Group (Years)	New Cases Observed 1996-2008	Expected Cases for Similar Groups[1,3]	Range of Plausible Numbers of New Cases [2,3]	
			Smallest	Largest
All Sites Combined				
0-14	42	50	27	62
15-19	23	22	13	39
Acute Lymphocytic Leukemia				
0-14	9	13	3	20
15-19	<5	2	0	9
Acute Myeloid Leukemia				
0-14	<5	3	0	9
15-19	0	1	0	5
Chronic Myeloid Leukemia				
0-14	<5	<1	0	7
15-19	<5	<1	0	7
Leukemia (Other)				
0-14	<5	17	6	27
15-19	0	3	<1	11
Hodgkin Lymphoma				
0-14	<5	2	0	7
15-19	5	3	1	14
Non-Hodgkin Lymphoma				
0-14	<5	3	0	9
15-19	<5	2	0	7
Brain and Central Nervous System				
0-14	10	11	4	21
15-19	<5	2	0	9
Kidney				
0-14	6	3	2	16
15-19	0	0	0	5
Larynx				
0-14	0	0	0	5
15-19	<5	0	0	7

Table 8 (continued): Numbers of New (Incident) Cancer Cases among Children Aged 0 to 19 Years in Carlsbad, with Expected Numbers for Similar Groups[1] and Range of Plausible Numbers of New Cases,[2] Diagnoses during 1996-2008

Cancer Site and Age Group (Years)	New Cases Observed 1996-2008	Expected Cases for Similar Groups[1,3]	Range of Plausible Numbers of New Cases [2,3]	
			Smallest	Largest
Lung and Bronchus				
0-14	0	0	0	5
15-19	<5	0	0	7
Oral Cavity and Pharynx				
0-14	<5	<1	0	7
15-19	<5	<1	0	7
Soft Tissue (Sarcoma)				
0-14	<5	3	<1	11
15-19	<5	1	0	9
Testis				
0-14	0	<1	0	5
15-19	<5	2	1	13
Thyroid				
0-14	<5	1	0	9
15-19	0	2	0	5

California Cancer Registry Data as of April 2010

1. Based on Incidence Rates for California, 1996-2008, by age, sex and race/ethnicity
2. 99% confidence limits around the observed from Poisson methods
3. Numbers are rounded to the nearest whole number

Table 9: Verification of Cancer Cases Collected by Carlsbad Community Survey Against California Cancer Registry (CCR) Database, May 2010

Total Number of Cases Collected by Community Survey		
	Number	**Percent**
Number Verified in CCR Database	94	37%
Number not Verified in CCR Database	159	63%
Total	**253**	**100%**

Table 10: Reasons that Cancer Cases Were Not Verified in the California Cancer Registry (CCR) Database, May 2010

Reasons that Cases were not found in CCR Database		
	Number	**Percent**
Incomplete Information (e.g., no name)	126	79%
Not a Case of Cancer (includes in situ cancers not reportable to CCR)	19	12%
Case Diagnosed in 2009 or Later (not in CCR yet)	9	6%
Not a California resident when case was diagnosed	3	2%
Case Diagnosed before 1988	2	1%
Total	**159**	**100%**

Figure 2. Map of Zip Codes and Census Tracts for Carlsbad, California