



Disparities in Stage at Diagnosis, Survival, and Quality of Cancer Care in California by Source of Health Insurance

Acknowledgements and Disclaimer

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This publication was prepared by the California Cancer Reporting and Epidemiologic Surveillance (CalCARES) Program, Institute for Population Health Improvement, University of California Davis Health System

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EXECUTIVE SUMMARY

Disparities in access to care, quality of treatment, and outcomes among persons having different sources of health insurance have been well documented for various conditions. Few studies, however, have broadly compared quality of care and outcomes for a condition, or set of conditions, across a population according to all the major categories of health insurance.

We report here the results of an exploratory evaluation of stage at diagnosis, quality of treatment, and survival among persons diagnosed with breast, colon, rectal, lung, and prostate cancer in California between 2004 and 2012, inclusive, according to the source of health insurance recorded in the California Cancer Registry (CCR). To the best of our knowledge, this is the first population-based overview of quality of care and outcomes among cancer patients in California that concomitantly looks at all the major sources of health insurance.

The diversity and size of California's population allow for a robust comparative analysis, although these data are not necessarily representative of the experience of patients covered by the same source of health insurance in other states (e.g., persons having health insurance coverage by Medicare, Department of Veterans Affairs (VA) or Department of Defense (DOD)).

The report's most notable findings include the following:

General and Cross-Cutting Findings

- Significant disparities in cancer survival and quality of care were found among persons having different sources of health insurance, and substantial opportunities for improved quality of care were found for all payers. The greatest number and largest disparities were found among persons insured by Medi-Cal or having Medicare-Medi-Cal dual eligibility or having no insurance.
- Medi-Cal patients having breast, colon and rectal cancer were more likely to be diagnosed at an advanced stage of disease and to have less favorable 5-year survival rates than persons having other sources of health insurance.
- Medicare-Medi-Cal dual eligible patients were the least likely to receive recommended treatment for breast and colon cancer.
- VA patients had the longest intervals between diagnosis and initiation of treatment for breast, colon, rectal, lung and prostate cancers, but their treatment outcomes compared favorably to patients with other types of health insurance and they were generally more likely to receive recommended treatment.

Breast Cancer

- Patients having DOD, private insurance, or Medicare coverage were significantly more likely to have breast cancer diagnosed at stage 0 or I (62.3%, 61.4% and 60.4%, respectively), while Medi-Cal patients were least likely to be diagnosed at an early stage (39%).
- Uninsured persons were most likely to have breast cancer diagnosed at stage IV (13.7%).

- VA patients were most likely to receive radiotherapy for positive regional lymph nodes following mastectomy (93.8%). Medicare and Medicare-Medi-Cal dual eligible patients were the least likely to receive this recommended treatment (49.6% and 46.8%, respectively), although not significantly less than uninsured patients.
- Patients with stage 0-II breast cancer covered by Medicare were significantly more likely to receive breast-conserving surgery (61.1%) than patients having any other source of insurance. Medi-Cal patients were the least likely to receive breast-conserving surgery (52.2%), although the difference was not significantly different from VA and uninsured patients.
- Breast cancer patients under 70 years of age who were uninsured or had Medi-Cal coverage were least likely to receive recommended radiotherapy following breast-conserving surgery (64.4% and 65.2%, respectively), and VA patients were most likely to receive this recommended treatment (74.1%), although these differences were not statistically significant.
- Patients with stage III breast cancer had the best 5-year relative survival if they were covered by DOD or private insurance (80.3% and 79.6%, respectively), while Medicare-Medi-Cal dual eligible and uninsured patients had the lowest 5-year relative survival (59.4% and 62.5%, respectively). The small number of VA patients diagnosed with stage III breast cancer precluded them from this comparison.

Colon Cancer

- Persons having DOD or VA coverage were most likely to have colon cancer diagnosed at stage 0 or I (48.1% and 37.5%, respectively), although these percentages were not significantly higher than for persons having Medicare or private insurance. Medi-Cal and uninsured persons were significantly less likely to be diagnosed at an early stage (20% and 18.1%, respectively) than persons having all other types of insurance.
- Medi-Cal and uninsured patients were the most likely to have colon cancer diagnosed at stage IV (31.9% and 28.7%, respectively), while VA patients were least likely to be diagnosed at a late stage (14.7%). These differences were statistically significant.
- DOD and VA colon cancer patients with stage III colon cancer were significantly more likely to be treated with adjuvant chemotherapy during the first course of treatment (83% and 82.4%, respectively), while Medicare-Medi-Cal dual eligible and Medicare patients were significantly less likely to receive this recommended treatment (51.1% and 53.7%, respectively).
- VA, DOD, and privately insured patients with stage III colon cancer had the highest 5-year relative survival rates (76.9%, 75.3% and 70.9%, respectively) although the estimate for DOD had a wide confidence interval due to the small number of cases and was not significantly different from uninsured patients. Medicare-Medi-Cal dual eligible patients had significantly lower 5-year relative survival (53%) than patients with all other types of insurance, while Medi-Cal patients had lower 5-year relative survival (56.6%) than all but Medicare patients.

Rectal Cancer

- Medi-Cal patients were less likely to have rectal (including recto-sigmoid) cancer diagnosed at stage 0 or I (25.2%) than patients having Medicare, VA, Medicare-Medi-Cal dual-eligibility, and private insurance coverage. Privately insured patients were most likely to be diagnosed at an early stage (43%), although the difference was significant only when compared to Medi-Cal and uninsured patients.

- VA patients less than age 80 with stage III rectal cancer were significantly more likely to receive or have radiation therapy considered/recommended (96.2%) during the first course of treatment than patients with all other sources of insurance. Medicare-Medi-Cal dual eligible and Medicare patients in this age group were significantly less likely to have this recommended treatment.
- Medi-Cal patients were more than twice as likely to have rectal cancer diagnosed at stage IV (30.9%) compared to privately insured patients (14.4%), a statistically significant difference.
- Medicare-Medi-Cal dual eligible patients with early stage rectal cancer had the lowest 5-year relative survival (65%). This was statistically significant.

Lung Cancer

- DOD and VA patients were most likely to have lung cancer diagnosed at stage I (26.4% and 24.5%, respectively), while Medi-Cal and uninsured patients were significantly less likely to be diagnosed at an early stage (11.6% and 7.6%, respectively).
- Uninsured and Medi-Cal patients were significantly more likely to have their cancer diagnosed at stage IV (68.5% and 61.5%, respectively) than persons with other sources of insurance.
- Five-year relative survival for early stage lung cancer (stage 0 or I) was highest for patients covered by DOD or private insurance (75.4% and 64.8%, respectively) and significantly lower for Medi-Cal and Medicare-Medi-Cal dual eligible patients (48% and 46.1%, respectively).

Prostate Cancer

- Medi-Cal patients were diagnosed with advanced (stage IV) prostate cancer more than three times as often as patients with private insurance or DOD coverage (18.6% compared to 5.6% and 5.7%, respectively), a highly significant difference.
- Five-year relative survival for metastatic prostate cancer (stage IV) was significantly lower for Medi-Cal patients (36.7%) than for those with VA, DOD or private insurance coverage; survival was significantly higher for patients having DOD coverage (69.5%) compared to all other sources of insurance.

This evaluation reveals substantial and heterogeneous disparities in stage at diagnosis, quality of care, and outcomes among cancer patients with different sources of health insurance. Finding that Medi-Cal, Medicare-Medi-Cal dual eligible, and uninsured patients were diagnosed at a later stage of cancer and had lower 5-year relative survival rates compared to persons having other types of insurance was not unexpected in view of other data in this regard and what is known about access to care and adverse social factors affecting the health of these populations; however, the lower quality of care cannot be as readily explained. In light of the recent rapid growth of Medi-Cal – both in covered lives and expenditures – the findings of this review highlight the need to further investigate the reasons for the disparities in cancer care outcomes and quality of care received by Medi-Cal and Medicare-Medi-Cal dual eligible beneficiaries. An investigation which links CCR and Medi-Cal eligibility and paid claims data (and possibly other state health databases) should be undertaken to better understand the reasons for the disparities observed in this exploratory study.

INTRODUCTION

Cancer is the second leading cause of death in California and the nation and is projected to become the leading cause of death by 2030.¹ The cost of cancer care has risen more rapidly in recent years than the cost of health care generally, and this disproportionate increase in cost combined with deficiencies in the quality of cancer care have been a matter of growing concern.² The estimated adjusted annual direct medical spending on cancer care in the U.S. doubled between 1990 and 2010, rising to an estimated \$125 billion.³ This figure is projected to reach at least \$158 billion by 2020, and may rise to \$207 billion.⁴ Loss of productivity and other indirect costs further increase the societal burden of cancer.

Cancer is primarily a disease of advanced age, and the rising incidence of cancer is primarily due to increased individual longevity and aging of the population. Increased cancer survival due to better treatments, new and more expensive cancer treatments, and the increasing prevalence of obesity-related cancers will further accelerate the rising cost of cancer care in coming years.

The escalating cost of cancer care coupled with an emerging value-based health care economy have increased calls for better information about cancer care outcomes and the quality of cancer treatment. Cancer treatment has generally improved in recent years, but disparities in quality of cancer treatment and survival rates according to source of health insurance are known to be significant population health problems.

Consistent with cancer incidence being closely related to advanced age, Medicare expends substantially more for cancer care than Medicaid, although Medicaid expenditures for cancer care are substantial. Over the years, between 7 and 10% of California's Medicaid program (Medi-Cal) expenditures have been for cancer care. The recent rapid growth of Medi-Cal underscores the need to understand its cancer care outcomes and the quality of care it is paying for. From fiscal year (FY) 2011-12 to FY 2014-15, Medi-Cal enrollment grew from 7 million to over 12 million members (an increase of some 75%) and annual expenditures grew from \$43 billion to over \$90 billion (an increase of approximately 110%). Based on historical spending patterns, this means Medi-Cal expenditures for cancer care have grown from some \$3 billion in FY 2011 to over \$6 billion in FY 2014.

Using data recorded in the California Cancer Registry (CCR), we analyzed quality of cancer care and outcomes for nearly 700,000 Californians according to their source of health insurance. We specifically assessed the stage at diagnosis, quality of treatment as measured by standard quality performance measures, and 5-year relative survival rates among persons diagnosed with breast, colon, rectal, lung, and prostate cancer in California between 2004 and 2012, inclusive. Although a number of studies have examined associations between specific types of health insurance and quality of cancer care and survival, this is, to the best of our knowledge, the first population-based comparative analysis of quality of care and outcomes among California cancer patients across all the major categories of health insurance.

METHODS

From 2004 through 2012, inclusive, 742,734 cases of breast, colon, rectal, lung and prostate cancer were reported to the California Cancer Registry (CCR), California's population-based cancer surveillance system.* Using information routinely collected by the CCR, the source of the patient's health insurance was identified for 703,603 (95%) of the cases. Information about source of health insurance recorded in the CCR varied by type of cancer, ranging from 92.4% for prostate cancer to 96.5% for colon cancer. Descriptive statistics and 95% confidence intervals (CI) on stage at diagnosis and 5-year relative survival by source of health insurance coverage were generated. Cancer treatment across categories of insurance coverage was evaluated using select Commission on Cancer (CoC) quality measures for which more complete information was available in the CCR.⁵ Since the CCR has been used primarily for public health surveillance purposes, and not quality of health care determinations, the CCR contains data about quality of care for only some CoC performance measures.

Sources of health insurance were aggregated into 7 categories for this analysis: Medicare, Medi-Cal (California's Medicaid program), Medicare-Medi-Cal dual eligible, private insurance (all types), Department of Veterans Affairs (VA), Department of Defense (DOD), and no insurance (see Table 1). For DOD coverage, we were unable to distinguish care provided through the TRICARE program from care provided at military treatment facilities (i.e., military hospitals and clinics). Likewise, for VA coverage, we were unable to distinguish between care provided at VA medical facilities from VA-contracted care, although informal communication from representatives of the VA suggested that VA contracts for relatively little cancer care in California. Patients with payer source designated as county health insurance or Indian Health Service were not included in the analysis due to the heterogeneity of program administration and delivery of care for these persons. There is great variation across California's 58 counties in the way county-financed health care is delivered. Some counties operate large health care systems, while others purchase medical services from private providers.⁶ The delivery of care among individuals with Indian Health Service (IHS) insurance also varies throughout the state because the vast majority of Native Americans in California reside in urban areas, rather than on reservations where residents are more likely to receive care via IHS facilities.⁷ Exclusion of individuals with county health and IHS insurance (5,578) reduced the number of cases available for analysis to 698,025 patients. Tables showing the numbers of cases by payer source are included in the sections detailing the findings by site of cancer.

Persons having Medicare-Medicaid dual eligibility (i.e., persons with Medicare primary coverage and Medicaid [Medi-Cal] supplemental insurance[†]) are of particular interest from a cancer care perspective because disproportionate numbers of these "dual eligible" persons are at higher risk for cancer (compared to the general population) due to advanced age and adverse socio-economic circumstances, among other factors. The size of the CCR database allowed for an examination of the Medicare-Medicaid dual eligible population.

Stage of disease at diagnosis was assigned according to rules developed by the American Joint Committee on Cancer (AJCC) and in place at the time of the cancer diagnosis. The CCR payer source variable corresponds to the information recorded for the patient at the end of the first course of treatment. Interval to treatment, or the time between diagnosis and treatment, was calculated as the

* Since 2012, the California Cancer Reporting and Epidemiologic Surveillance (CalCARES) Program, within the Institute for Population Health Improvement, University of California Davis, has partnered with the California Department of Public Health to manage day-to-day operations of the CCR.

† Medi-Cal is California's Medicaid program, providing health insurance for more than 12 million members as of January 2015, for an annual cost of more than \$90 billion per year.

difference in days from the recorded date of diagnosis and either the date of surgery or the date of first non-surgical treatment, whichever came first. Because of wide variation in the interval between diagnosis and initiation of treatment, median days to treatment were calculated rather than the average number of days. Five-year relative survival estimates were obtained for each cancer site, stratified by stage at diagnosis. Relative survival approximates the likelihood that the patient will not die of the diagnosed cancer within the specified time interval and is calculated as the ratio of the observed survival rate divided by the expected (life table) mortality for a person of the same sex, age, and race/ethnicity.

Table 1: Categories of Source of Health Insurance (Payer Source)*

Major Payer Source Category	Primary Payer Codes
Medi-Cal	-Medicaid, fee for service -Medicaid administered through managed care
Medicare	-Medicare, NOS** -Medicare-administered through managed care
Medicare-Medi-Cal Dual Eligible (Dual Eligible)	-Medicare with Medicaid co-insurance
Private	-HMO -PPO -Private insurance managed care, HMO or PPO -Private fee for service -Medicare w/supplement, NOS -Medicare w/private supplement -Insurance, NOS
U.S. Department of Defense (DOD)	-Military Treatment Facilities -TRICARE
U.S. Department of Veterans Affairs (VA)	-Veterans Affairs (VA)
Uninsured	-Not insured -Not insured, self-pay

*Primary payer codes are based on the Facility Oncology Registry Data Standards (FORDS), Commission on Cancer, American College of Surgeons, 2010 Revision.

**NOS-Not otherwise specified

RESULTS

The most pertinent results of this analysis are detailed below according to the type of cancer.

Of note, percentages cited in the narrative text were calculated excluding unknown values, which may result in some minor discrepancies with percentages cited in the tables themselves.

Breast Cancer

A total of 260,590 women with breast cancer were reported to the CCR from 2004 through 2012 (Table 2). Excluding 9,472 women for whom type of insurance was not recorded, data from 251,118 (96.4%) were used to evaluate stage of disease at diagnosis, five-year relative survival, and interval to treatment. Three CoC standard performance measures were used to evaluate quality of care: (i) percentage of breast cancer cases with ≥ 4 positive regional lymph nodes for which radiation therapy was considered or administered following a mastectomy; (ii) percentage of breast-conserving surgery among women diagnosed with AJCC stage 0, I, or II disease; and (iii) percentage of women under 70 years of age undergoing breast-conserving surgery who received radiation therapy.

Results were as follows:

- The stage at which breast cancer patients were diagnosed varied substantially by source of health insurance (Figure 1 and Table 2). Sixty percent or more of patients covered by DOD, private insurance, or Medicare were diagnosed with *in situ* (stage 0) or stage I tumors, but only 39% of Medi-Cal patients were diagnosed at an early stage of the disease, a statistically significant difference.
- Medi-Cal had the largest percentage of patients diagnosed at a late stage of disease (26.9% diagnosed at stages III or IV). DOD covered and privately insured patients had the lowest percentage diagnosed at a late stage (11.2% and 11.9%, respectively).
- Of the three breast cancer quality of care measures (Figures 2-4), the only measure for which Medi-Cal enrollees fared comparable to privately insured patients was the proportion of mastectomy-treated cases with four or more positive nodes for whom radiotherapy was given or considered: 58.1% of Medi-Cal patients compared to 57.6% of privately insured patients (Figure 2). VA patients had the highest percentage of patients in compliance with this measure (93.8%), while compliance was lowest for Medicare and Medicare-Medi-Cal dual-eligible patients (49.6% and 46.8%, respectively).
- Less disparity in the proportion of women diagnosed with stages 0-II breast cancer who received breast-conserving surgery (BCS) was observed among payers (Figure 3). Medi-Cal patients were the least likely to receive BCS (52.2%) although this was not significantly different from VA and uninsured patients. Patients covered by Medicare or private insurance had significantly higher rates of BCS (61.1% and 60.1%, respectively) than Medi-Cal, Medicare-Medi-Cal dual eligible, or uninsured patients.
- Uninsured and Medi-Cal patients under 70 years of age had the lowest compliance with the recommendation for radiotherapy following BCS (64.4% and 65.2%, respectively) (Figure 4). While VA patients were among the least likely to be treated with BCS, they had the highest proportion

compliant with the recommended use of radiotherapy following BCS (74.1%). The number of VA patients was quite small (n = 80). None of these differences were statistically significant.

- Patients covered by VA and Medi-Cal had the longest median time between the diagnosis of breast cancer and initiation of definitive treatment (33 and 32 days, respectively) (Figure 5). Privately insured patients had the shortest interval to treatment, with a median time of 26 days.
- Five-year relative survival for patients diagnosed with early-stage breast cancer did not materially vary by source of insurance coverage, although survival for stage II disease was significantly lower for Medicare-Medi-Cal dual eligible patients (Figure 6). Among women diagnosed with stage III breast cancer, those who were privately insured or had DOD coverage had significantly better survival (79.6% and 80.3%). Survival among VA patients was also high (84.5%), but there were only 25 patients in this group so these results must be interpreted cautiously. Stage III patients with Medicare-Medi-Cal dual-eligibility or who were uninsured had significantly lower survival (59.4% and 62.5%) than patients with other sources of insurances.
- Relatively large differences in survival by payer source were observed among patients with stage IV disease. Due to the small number of patients, differences between DOD and all other payer sources could not be evaluated. Five year relative survival for uninsured patients was substantially and significantly lower (11.8%) than those with private insurance (31.2%). At 22%, 5-year relative survival for Medi-Cal patients was about a third lower than for women covered by private insurance.
- There were substantially fewer DOD and VA breast cancer patients compared to other payers, so these findings must be interpreted with caution.

Table 2: Breast Cancer Stage at Diagnosis by Payer Source, California 2004-2012

Payer	In Situ n (%)	I n (%)	II n (%)	III n %	IV n %	Unknown n (%)	Total n (%)
Medi-Cal	2,736 (13%)	5,175 (24%)	6,912 (32%)	3,741 (17%)	1,718 (8%)	1,208 (6%)	21,490 (100%)
Dual Eligible	1,345 (14%)	3,087 (32%)	2,593 (27%)	1,153 (12%)	635 (7%)	708 (7%)	9,521 (100%)
Medicare	4,995 (16%)	12,527 (41%)	7,464 (24%)	2,572 (8%)	1,474 (5%)	1,592 (5%)	30,624 (100%)
Private	37,571 (20%)	71,584 (39%)	47,542 (26%)	15,395 (8%)	5,699 (3%)	5,524 (3%)	183,315 (100%)
DOD	461 (25%)	645 (36%)	471 (26%)	134 (7%)	64 (4%)	41 (2%)	1,816 (100%)
VA	60 (17%)	126 (35%)	104 (29%)	32 (9%)	17 (5%)	17 (5%)	356 (100%)
Other	324 (18%)	434 (24%)	538 (30%)	251 (14%)	144 (8%)	83 (5%)	1,774 (100%)
Uninsured	328 (15%)	547 (25%)	583 (26%)	278 (13%)	275 (12%)	211 (9%)	2,222 (100%)
Unknown	1,720 (18%)	2,476 (26%)	1,746 (18%)	761 (8%)	356 (4%)	2,413 (25%)	9,472 (100%)
Total	49,540 (19%)	96,601 (37%)	67,953 (26%)	24,317 (9%)	10,382 (4%)	11,797 (5%)	260,590 (100%)

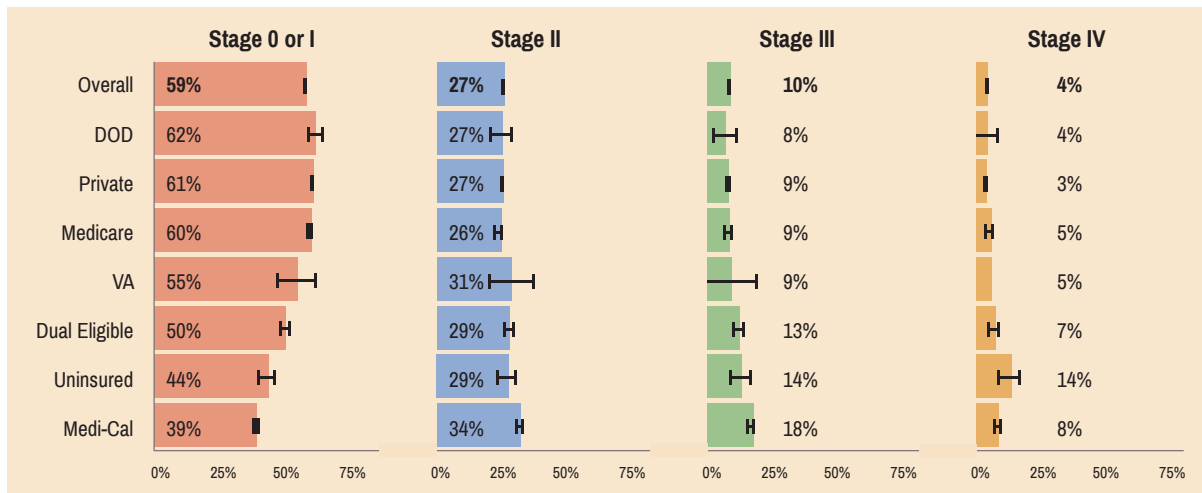
Note: Row percentages may not always add to 100 due to rounding.

Percentages cited in the text exclude unknown/other values and may not match those in the table.

Data Source: California Cancer Registry, California Department of Public Health

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Figure 1. Percentage of Breast Cancer Cases by Stage at Diagnosis and Payer Source: California 2004-2012



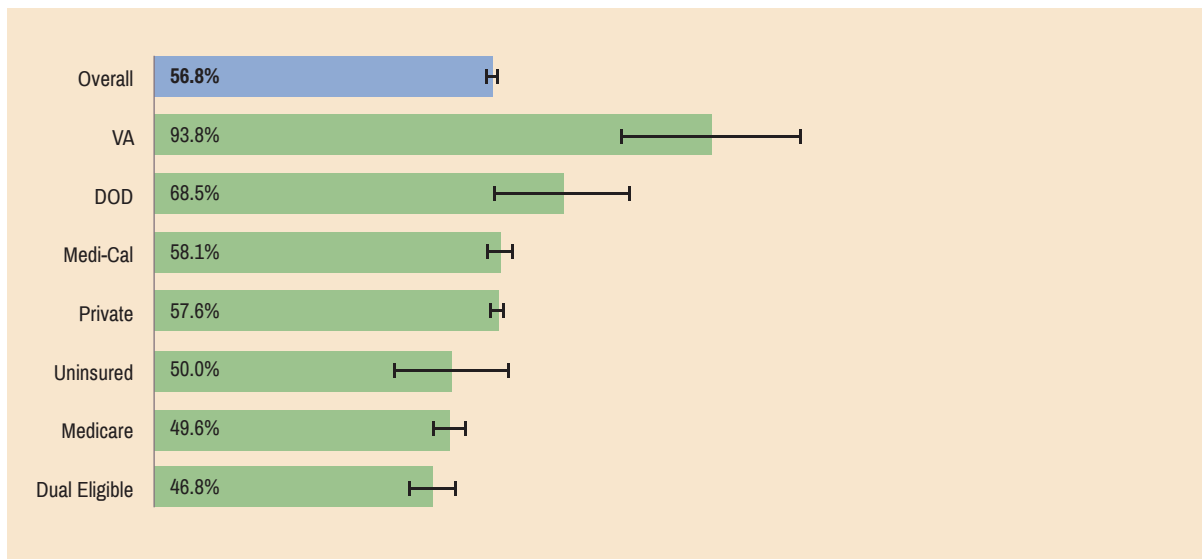
—|: 95% confidence interval

Individuals with unknown/other payer or unknown stage were excluded from the analysis.

Data Source: California Cancer Registry, California Department of Public Health

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Figure 2. Percentage of Breast Cancer Cases with ≥ 4 Positive Regional Lymph Nodes for which Radiation Therapy was Considered or Administered Following a Mastectomy, by Payer Source: California 2004-2012

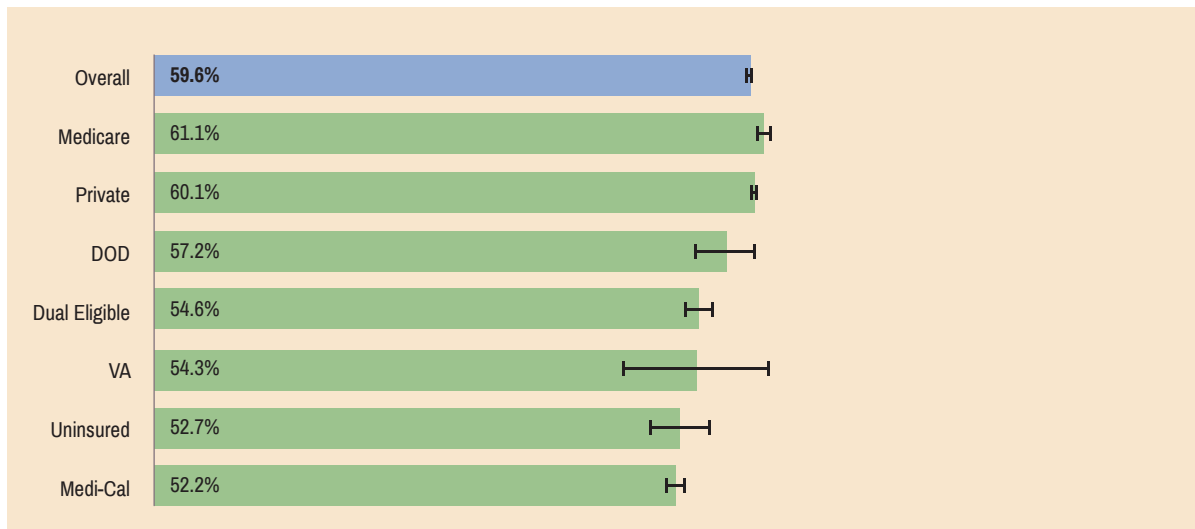


—|: 95% confidence interval

Data Source: California Cancer Registry, California Department of Public Health

Prepared by the California Cancer Reporting and Epidemiologic Surveillance (CalCARES) Program, Institute for Population Health Improvement, UC Davis Health System

Figure 3. Percentage undergoing Breast-Conserving Surgery among Patients with AJCC Stage 0, I or II at Breast Cancer Diagnosis, by Payer Source: California, 2004-2012

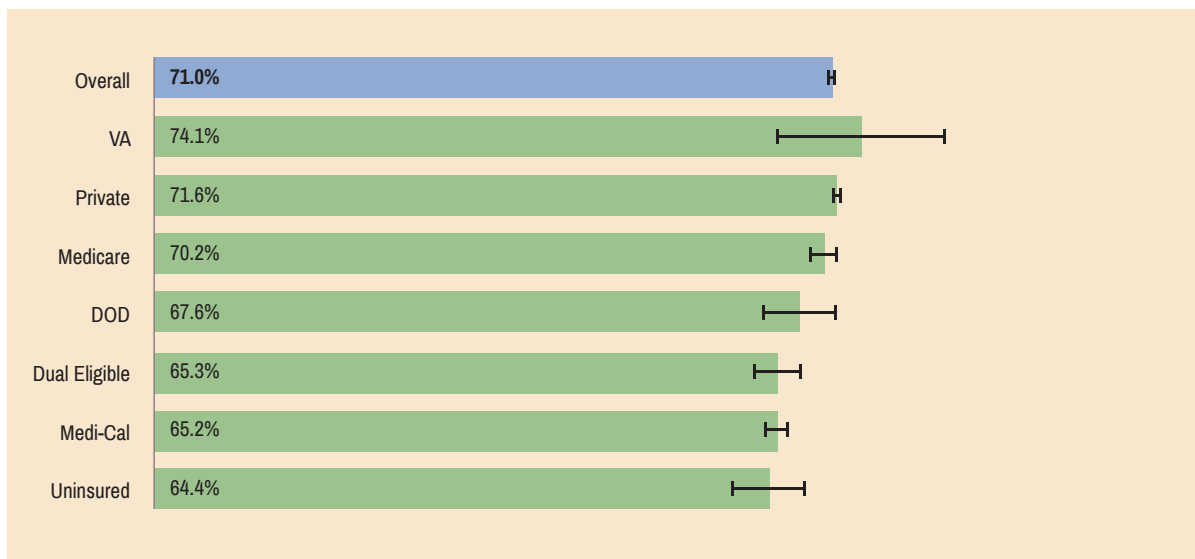


—|—: 95% confidence interval

Data Source: California Cancer Registry, California Department of Public Health

Prepared by the California Cancer Reporting and Epidemiologic Surveillance (CalCARES) Program, Institute for Population Health Improvement, UC Davis Health System

Figure 4. Percentage of Patients Under 70 Undergoing Breast-Conserving Surgery who Received Radiation Therapy, by Payer Source: California, 2004-2012

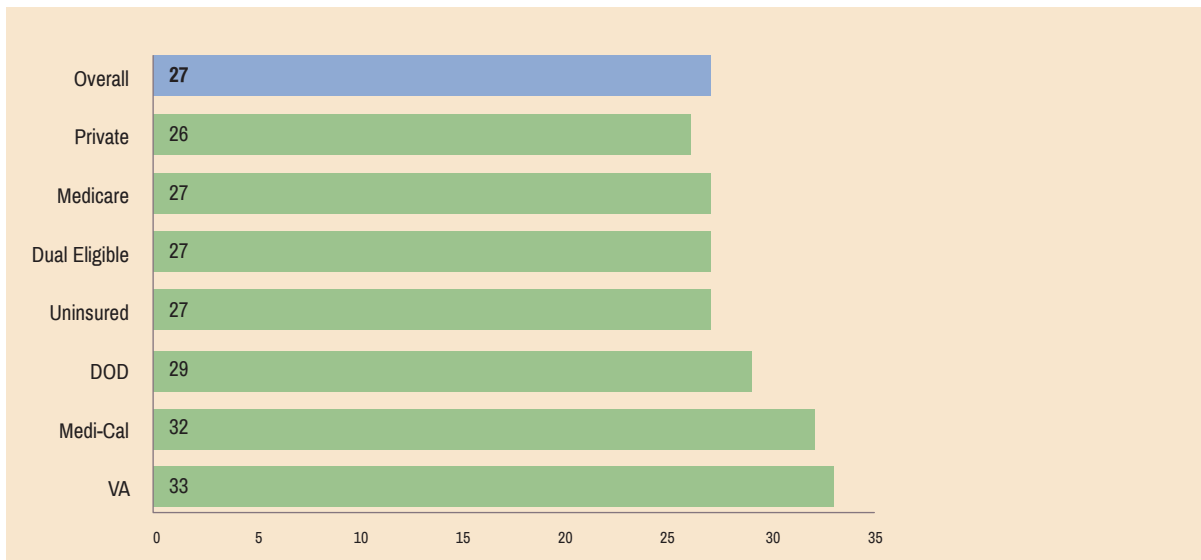


—|—: 95% confidence interval

Data Source: California Cancer Registry, California Department of Public Health

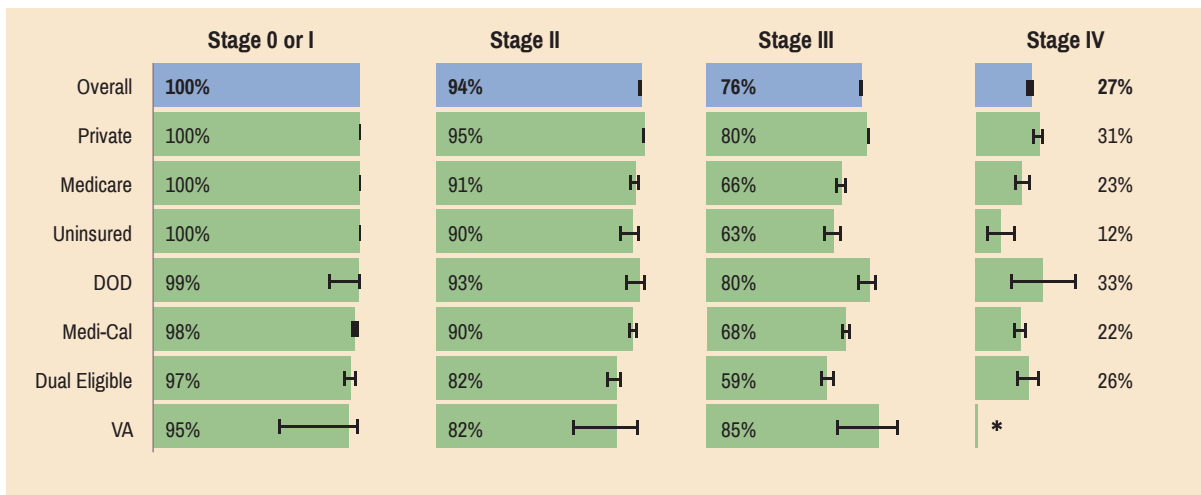
Prepared by the California Cancer Reporting and Epidemiologic Surveillance (CalCARES) Program, Institute for Population Health Improvement, UC Davis Health System

Figure 5. Median Number of Days between the Diagnosis and Initial Treatment for Breast Cancer, by Payer Source: California, 2004-2012



Data Source: California Cancer Registry, California Department of Public Health
 Prepared by the California Cancer Reporting and Epidemiologic Surveillance (CalCARES) Program, Institute for Population Health Improvement, UC Davis Health System

Figure 6. Five-Year Relative Survival among Breast Cancer Cases by Payer Source and AJCC Stage at Diagnosis: California 2004-2012



—|—: 95% confidence interval

*Survival could not be calculated due to small sample size.

Data Source: California Cancer Registry, California Department of Public Health
 Prepared by the California Cancer Reporting and Epidemiologic Surveillance (CalCARES) Program, Institute for Population Health Improvement, UC Davis Health System

Colon Cancer

A total of 97,947 Californians with colon cancer were reported to the CCR from 2004 through 2012 (Table 3). Excluding 3,388 patients for whom type of insurance was not recorded, data from 94,559 (96.5%) were available to evaluate stage of disease at diagnosis, five-year relative survival, and interval to treatment. Two CoC measures were used to evaluate the quality of care received by colon cancer patients: (i) percentage of AJCC stage III colon cancer cases for whom adjuvant chemotherapy was considered or administered, and (ii) percentage of AJCC stage II or III colon cancer cases for whom at least 12 regional lymph nodes were removed and pathologically examined for resected colon cancer.

Results were as follows:

- Statistically significant variations in stage of disease at diagnosis were observed according to payer source (Figure 7 and Table 3). Among uninsured and Medi-Cal patients, only 18.1% and 20%, respectively, were diagnosed at stages 0 or I. The percentage of colon cancers diagnosed at an early stage was significantly higher among patients covered by VA than for all other groups (48.1%).
- Medi-Cal and uninsured patients were significantly more likely to be diagnosed with stage IV colon cancer (31.9% and 28.7%) than all other groups. VA patients were least likely to be diagnosed at stage IV (14.7%).
- The proportion of patients diagnosed with stage III colon cancer who were administered adjuvant chemotherapy, or for whom it was considered, during the first course of treatment was significantly lower for patients with Medicare-Medi-Cal dual eligibility or Medicare coverage (51.1% and 53.7%, respectively). Compliance with this quality of care measure was significantly higher for DOD and VA patients (83% and 82.4%, respectively) (Figure 8).
- Less disparity was noted among the proportion of colon cancer patients for whom at least 12 regional lymph nodes were removed and pathologically examined after surgical resection (Figure 9). Compliance with this recommended treatment was similar among Medi-Cal, Medicare, and privately insured patients, ranging between 71.7% and 74.3%. These percentages were significantly lower than VA, DOD or uninsured patients. Medicare-Medi-Cal dual eligible patients had the lowest compliance with this recommendation (65.9%); this finding was statistically significant.
- VA patients had the longest interval between diagnosis and initiation of treatment (13 days) (Figure 10). There was little variation in the length of time from colon cancer diagnosis to treatment among patients covered by other insurers, where it ranged from 3 to 6 days.
- Significant disparities in five-year relative survival were found (Figure 11). This was particularly true among patients diagnosed with stage III colon cancer, who had a better prognosis if covered by VA, DOD, or private insurance compared to Medicare-Medi-Cal dual eligible and Medi-Cal patients.

Table 3: Colon Cancer Stage at Diagnosis by Payer Source

Payer	In Situ n (%)	I n (%)	II n (%)	III n %	IV n %	Unknown n (%)	Total n (%)
Medi-Cal	316 (6%)	719 (13%)	1,211 (22%)	1,283 (23%)	1,650 (30%)	369 (7%)	5,548 (100%)
Dual Eligible	490 (7%)	1,301 (18%)	1,770 (25%)	1,570 (22%)	1,377 (20%)	528 (8%)	7,036 (100%)
Medicare	1,327 (7%)	3,836 (21%)	4,696 (26%)	4,026 (22%)	3,131 (17%)	1,088 (6%)	18,104 (100%)
Private	5,226 (9%)	12,952 (22%)	14,570 (25%)	13,436 (23%)	10,340 (18%)	2,509 (4%)	59,033 (100%)
DOD	48 (10%)	118 (25%)	95 (21%)	107 (23%)	75 (16%)	20 (4%)	463 (100%)
VA	339 (20%)	450 (27%)	328 (19%)	284 (17%)	241 (14%)	46 (3%)	1,688 (100%)
Other	55 (6%)	142 (16%)	236 (26%)	236 (26%)	193 (21%)	42 (5%)	904 (100%)
Uninsured	93 (5%)	208 (12%)	471 (26%)	413 (23%)	477 (27%)	121 (7%)	1,783 (100%)
Unknown	341 (10%)	359 (11%)	238 (7%)	242 (7%)	477 (14%)	1,731 (51%)	3,388 (100%)
Total	8,235 (8%)	20,085 (21%)	23,615 (24%)	21,597 (22%)	17,961 (18%)	6,454 (7%)	97,947 (100%)

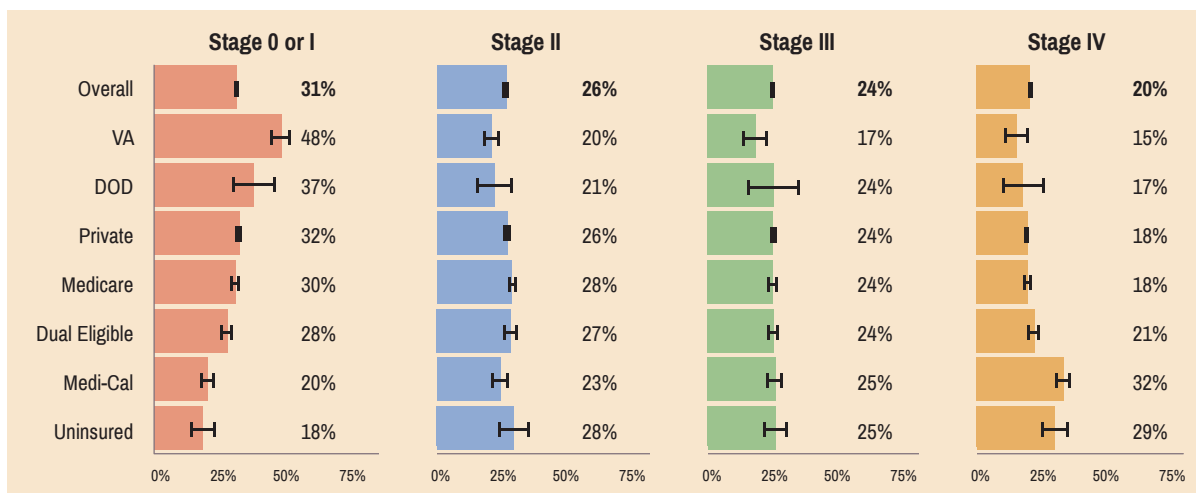
Note: Row percentages may not always add to 100 due to rounding.

Percentages cited in the text exclude unknown/other values and may not match those in the table.

Data Source: California Cancer Registry, California Department of Public Health

Prepared by the California Cancer Reporting and Epidemiologic Surveillance (CalCARES) Program, Institute for Population Health Improvement, UC Davis Health System

Figure 7. Percentage of Colon Cancer Cases by Stage at Diagnosis and Payer Source: California 2004-2012



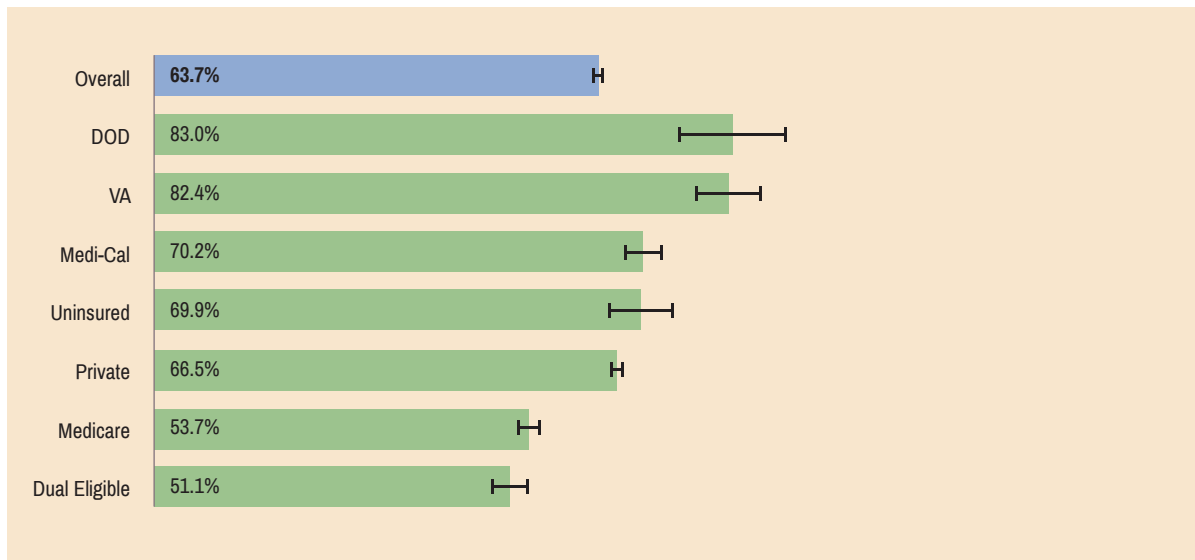
—|—: 95% confidence interval

Individuals with unknown/other payer or unknown stage were excluded from the analysis.

Data Source: California Cancer Registry, California Department of Public Health

Prepared by the California Cancer Reporting and Epidemiologic Surveillance (CalCARES) Program, Institute for Population Health Improvement, UC Davis Health System

Figure 8. Percentage of AJCC Stage III Colon Cancer Cases for whom Adjuvant Chemotherapy was Considered or Administered: California 2004-2012

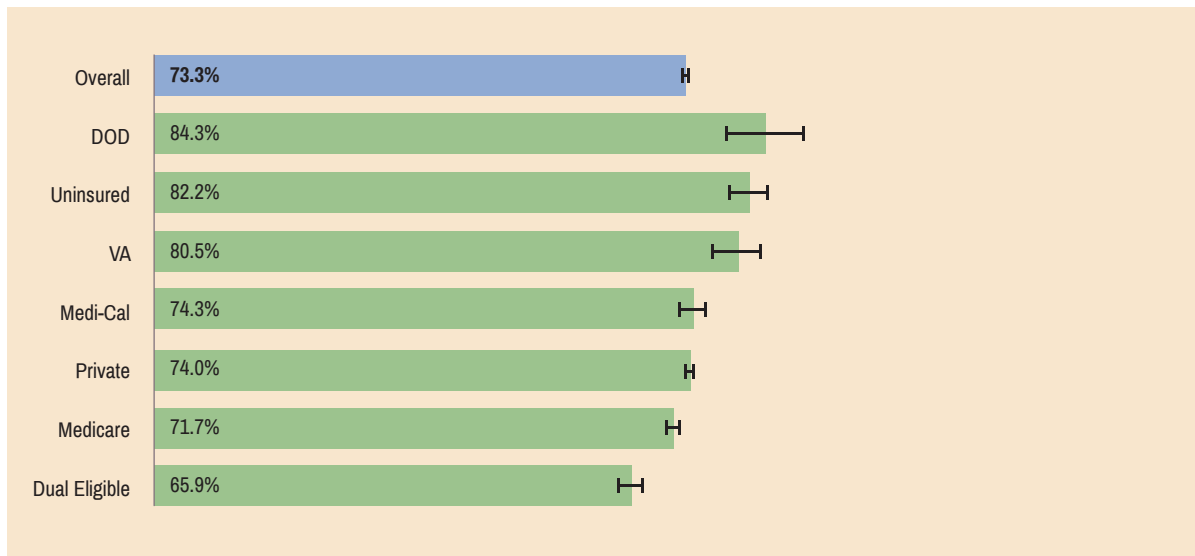


I—I: 95% confidence interval

Data Source: California Cancer Registry, California Department of Public Health

Prepared by the California Cancer Reporting and Epidemiologic Surveillance (CalCARES) Program, Institute for Population Health Improvement, UC Davis Health System

Figure 9. Percentage of AJCC Stage II or III Resected Colon Cancer Cases for whom at least 12 Regional Lymph Nodes were Removed and Pathologically Examined: California, 2004-2012

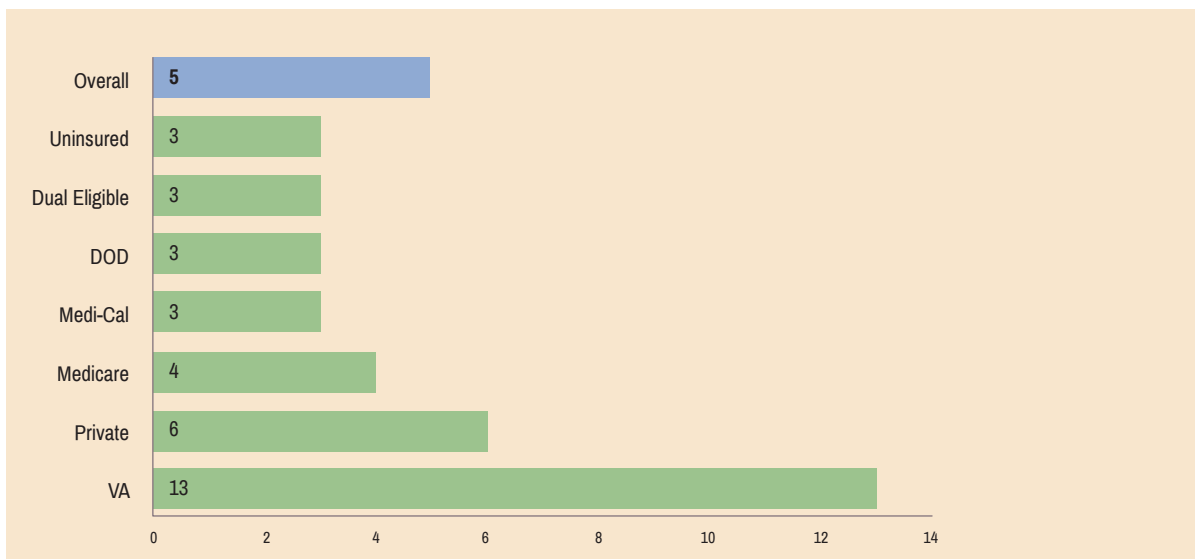


I—I: 95% confidence interval

Data Source: California Cancer Registry, California Department of Public Health

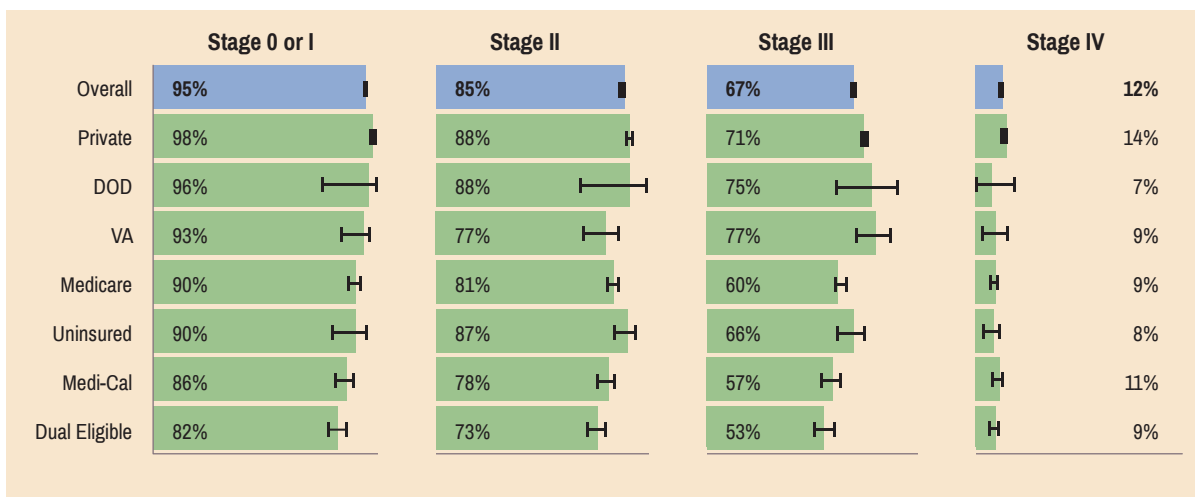
Prepared by the California Cancer Reporting and Epidemiologic Surveillance (CalCARES) Program, Institute for Population Health Improvement, UC Davis Health System

Figure 10. Median Number of Days between the Diagnosis and Initial Treatment for Colon Cancer by Payer Source: California, 2004-2012



Data Source: California Cancer Registry, California Department of Public Health
 Prepared by the California Cancer Reporting and Epidemiologic Surveillance (CalCARES) Program, Institute for Population Health Improvement, UC Davis Health System

Figure 11. Five-Year Relative Survival among Colon Cancer Cases by Payer Source and AJCC Stage at Diagnosis: California 2004-2012



I—I: 95% confidence interval

Data Source: California Cancer Registry, California Department of Public Health
 Prepared by the California Cancer Reporting and Epidemiologic Surveillance (CalCARES) Program, Institute for Population Health Improvement, UC Davis Health System

Rectum and Rectosigmoid Cancer

During the study period, 30,334 Californians with cancer of the rectum and rectosigmoid were reported to the CCR (Table 4); 1,355 patients were excluded from the analysis because their source of insurance was not recorded, leaving data for 28,979 (95.5%) available for evaluation. One CoC measure was used to evaluate quality of care: the percentage of patients under 80 years of age diagnosed with AJCC Stage II rectal cancer receiving surgical resection for whom radiation therapy was considered or administered.

Results were as follows:

- Except for Medi-Cal and uninsured patients, only minor disparities in rectal cancer stage at diagnosis were found (Figure 12 and Table 4). Privately insured patients were most likely to be diagnosed with stage 0 or I rectal cancer (43%), although the differences were significant only when compared with Medi-Cal and uninsured patients. Medi-Cal had the lowest percentage of patients diagnosed at an early stage (25.2%), significantly less than for private insurance, Medicare, VA, and Medicare-Medi-Cal dual eligibles.
- The percentage of persons with rectal cancer diagnosed at stage IV was more than twice as high among Medi-Cal patients (30.9%) than privately insured patients (14.4%), a statistically significant difference.
- The proportion of patients less than 80 years of age diagnosed with stage III rectal cancer and for whom radiation therapy was administered or considered during the first course of treatment varied substantially (Figure 13). The proportion of patients receiving this recommended therapy was higher for VA patients (96.2%) than for patients with all other sources of insurance, and significantly so for all except DOD. Compliance with recommended radiotherapy was significantly lower among Medicare-Medi-Cal dual eligible and Medicare patients than among those covered by DOD, Medi-Cal, or private insurance.
- The median interval to treatment (Figure 14) was longest for VA patients (31.5 days), followed by Medi-Cal and uninsured patients (median 24 and 23 days, respectively). Median interval to treatment times for patients with other sources of insurance varied little, ranging from 17 to 21 days.
- Five-year relative survival for privately insured patients was highest for almost all stages of disease at diagnosis (Figure 15). Survival for patients diagnosed with stage 0 or I disease was significantly lower among those with Medicare-Medi-Cal dual eligibility (65%) than for those with any other type of insurance, followed by Medi-Cal (76.7%). Five-year survival for stage IV rectal cancer is usually poor, and was significantly lower among patients insured by Medicare or with Medicare-Medi-Cal dual eligibility (4.5% and 4.7%, respectively).

Table 4: Rectal Cancer Stage at Diagnosis by Payer Source

Payer	In Situ n (%)	I n (%)	II n (%)	III n %	IV n %	Unknown n (%)	Total n (%)
Medi-Cal	122 (5%)	356 (16%)	367 (16%)	467 (21%)	586 (26%)	336 (15%)	2,234 (100%)
Dual Eligible	137 (7%)	461 (24%)	327 (17%)	368 (19%)	271 (14%)	328 (17%)	1,892 (100%)
Medicare	417 (10%)	1,124 (26%)	770 (18%)	778 (18%)	615 (14%)	670 (15%)	4,374 (100%)
Private	1,840 (10%)	5,048 (27%)	2,925 (16%)	3,893 (21%)	2,305 (12%)	2,664 (14%)	18,675 (100%)
DOD	13 (8%)	46 (27%)	26 (15%)	36 (21%)	25 (14%)	27 (16%)	173 (100%)
VA	87 (15%)	125 (22%)	104 (18%)	145 (25%)	74 (13%)	40 (7%)	575 (100%)
Other	25 (6%)	75 (18%)	74 (18%)	108 (26%)	86 (21%)	51 (12%)	419 (100%)
Uninsured	43 (7%)	117 (18%)	98 (15%)	116 (18%)	147 (23%)	116 (18%)	637 (100%)
Unknown	130 (10%)	184 (14%)	103 (8%)	170 (13%)	133 (10%)	635 (47%)	1,355 (100%)
Total	2,814 (9%)	7,536 (25%)	4,794 (16%)	6,081 (20%)	4,242 (14%)	4,867 (16%)	30,334 (100%)

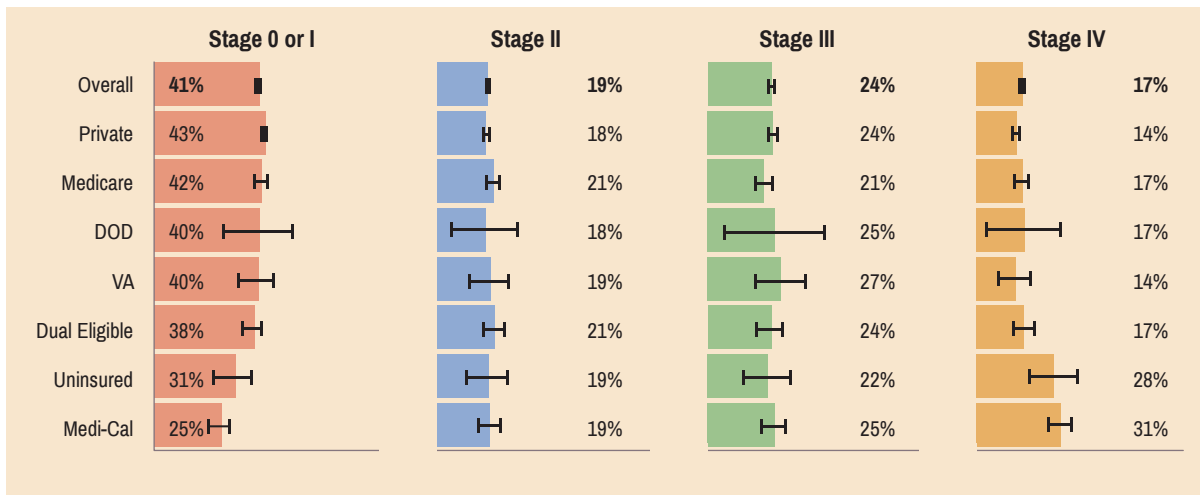
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Percentages cited in the text exclude unknown/other values and may not match those in the table.

Data Source: California Cancer Registry, California Department of Public Health

Prepared by the California Cancer Reporting and Epidemiologic Surveillance (CalCARES) Program, Institute for Population Health Improvement, UC Davis Health System

Figure 12. Percentage of Rectal Cancer Cases by Stage at Diagnosis and Payer Source: California, 2004-2012



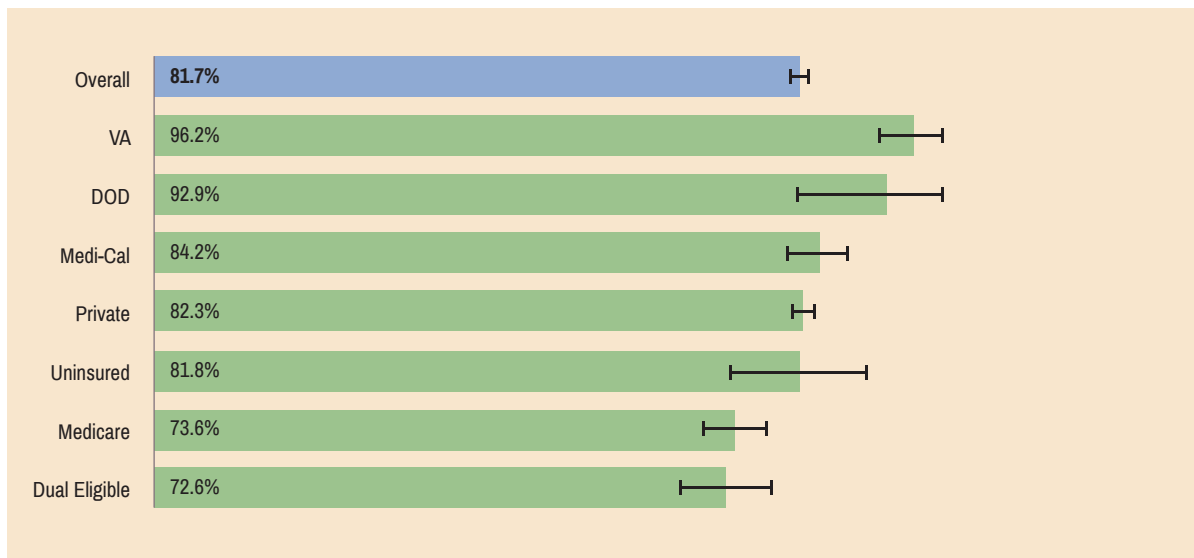
—|—: 95% confidence interval

Individuals with unknown/other payer or unknown stage were excluded from the analysis.

Data Source: California Cancer Registry, California Department of Public Health

Prepared by the California Cancer Reporting and Epidemiologic Surveillance (CalCARES) Program, Institute for Population Health Improvement, UC Davis Health System

Figure 13. Percentage of Patients under 80 Diagnosed with AJCC Stage II Rectal Cancer Receiving Surgical Resection for whom Radiation Therapy was Considered or Administered: California 2004-2012

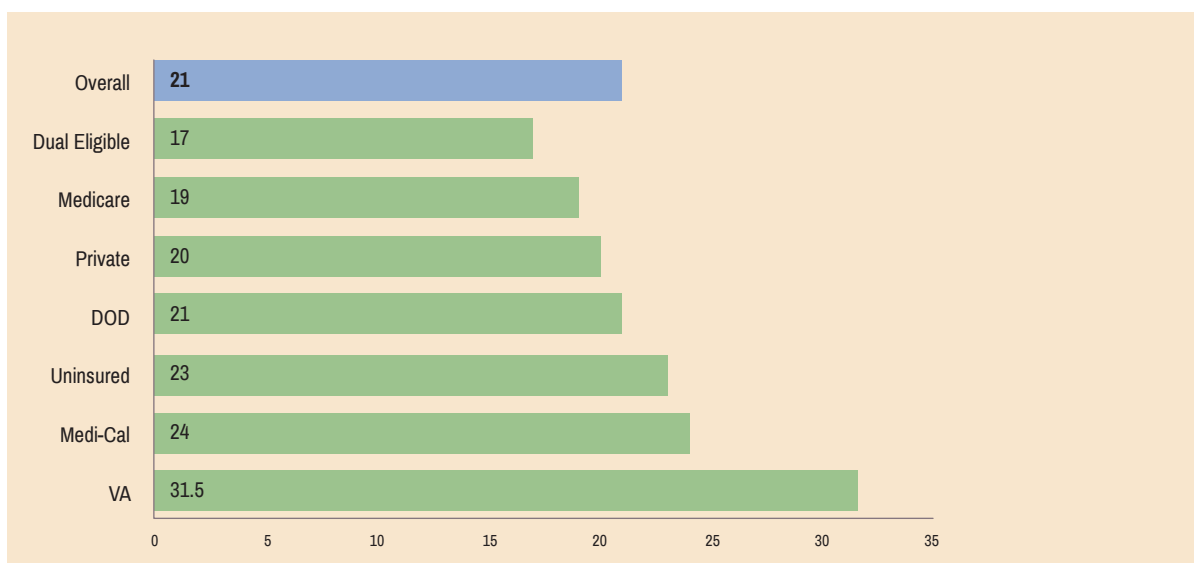


—|—: 95% confidence interval

Data Source: California Cancer Registry, California Department of Public Health

Prepared by the California Cancer Reporting and Epidemiologic Surveillance (CalCARES) Program, Institute for Population Health Improvement, UC Davis Health System

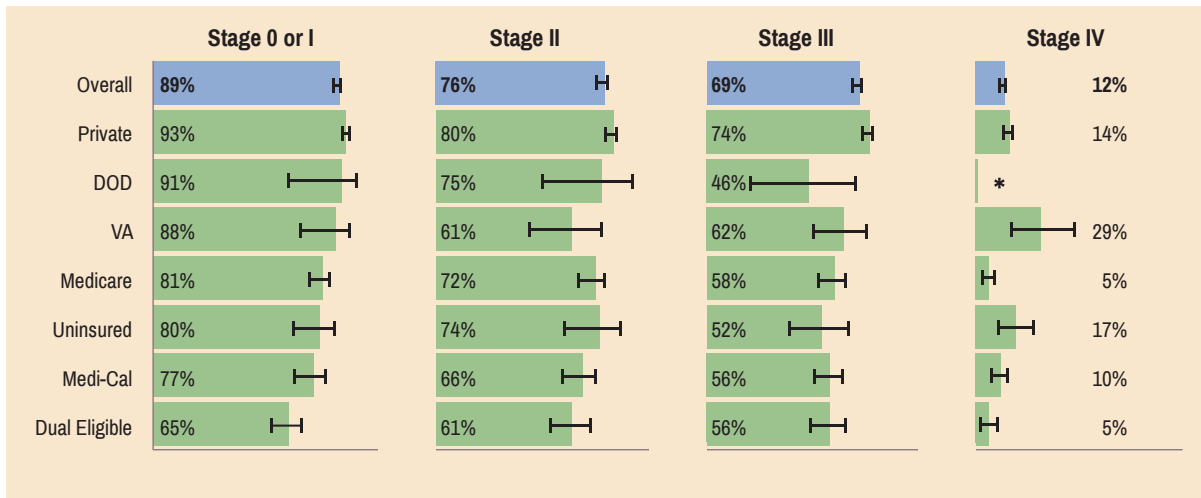
Figure 14. Median Number of Days between the Diagnosis and Initial Treatment for Rectal Cancer by Payer Source: California, 2004-2012



Data Source: California Cancer Registry, California Department of Public Health

Prepared by the California Cancer Reporting and Epidemiologic Surveillance (CalCARES) Program, Institute for Population Health Improvement, UC Davis Health System

Figure 15. Five-Year Relative Survival among Rectal Cancer Cases by Payer Source and AJCC Stage at Diagnosis: California 2004-2012



I—I: 95% confidence interval

*Survival could not be calculated due to small sample size.

Data Source: California Cancer Registry, California Department of Public Health

Prepared by the California Cancer Reporting and Epidemiologic Surveillance (CalCARES) Program, Institute for Population Health Improvement, UC Davis Health System

Lung and Bronchus Cancer

A total of 155,820 Californians with lung and bronchus cancer were reported to the CCR between 2004 and 2012 (Table 5). Excluding 9,887 patients for whom type of health insurance was not recorded, data from 145,933 (93.7%) were available for the evaluation. CCR data are not sufficiently detailed to address any of the CoC quality measures for lung cancer.

Results were as follows:

- Lung cancer is usually detected at a late stage and, consequently, generally has a poor prognosis. Nonetheless, notable disparities in stage at diagnosis were found (Figure 16 and Table 5). The highest percentages of stage 0 or I diagnoses were found for patients with DOD or VA coverage (26.4% and 24.5%, respectively), although the difference was only significant compared to Medi-Cal and uninsured patients, who had the lowest percentages of early diagnoses (11.6% and 7.6%, respectively).
- VA patients had a significantly lower proportion of persons diagnosed with stage IV disease (45.5%), while patients who lacked insurance or were covered by Medi-Cal had significantly higher percentages of stage IV diagnoses than any other type of insurance (68.5% and 61.5%, respectively).
- Similar to what was noted for other cancers, the median time between diagnosis and the beginning of treatment for lung cancer (Figure 17) was longest for VA patients (40 days). The median interval to treatment was shortest for patients without insurance (22 days). The median interval to treatment for patients covered by other insurers varied from 24 days for patients covered by Medi-Cal to 29 days for those with Medicare.
- Significant differences in five-year relative survival for lung cancer were noted among patients diagnosed with stage I disease (Figure 18). Five-year relative survival for early stage disease was highest for DOD patients (75.4%) or persons with private insurance (64.8%), and lowest for patients with Medicare-Medi-Cal dual eligibility (46.1%) or Medi-Cal coverage (48%). Among uninsured patients, confidence intervals around the estimated survival were too wide for meaningful comparisons. Survival disparities among patients diagnosed with advanced lung cancer did not follow a clear pattern.

Table 5: Lung Cancer Stage at Diagnosis by Payer Source

Payer	In Situ n (%)	I n (%)	II n (%)	III n %	IV n %	Unknown n (%)	Total n (%)
Medi-Cal	8 (0%)	1,007 (10%)	359 (4%)	1,993 (21%)	5,383 (56%)	921 (10%)	9,671 (100%)
Dual Eligible	14 (0%)	2,100 (17%)	567 (4%)	2,743 (22%)	5,655 (45%)	1,558 (12%)	12,637 (100%)
Medicare	28 (0%)	5,867 (18%)	1,649 (5%)	6,508 (20%)	14,239 (45%)	3,698 (12%)	31,989 (100%)
Private	86 (0%)	16,254 (19%)	4,288 (5%)	17,208 (21%)	38,064 (46%)	7,594 (9%)	83,494 (100%)
DOD	(0%)	210 (25%)	50 (6%)	172 (20%)	362 (43%)	53 (6%)	847 (100%)
VA	1 (0%)	801 (23%)	188 (5%)	796 (23%)	1,494 (44%)	152 (4%)	3,432 (100%)
Other	1 (0%)	135 (11%)	40 (3%)	272 (22%)	699 (56%)	97 (8%)	1,244 (100%)
Uninsured	(0%)	180 (7%)	59 (2%)	506 (19%)	1,617 (62%)	257 (10%)	2,619 (100%)
Unknown	4 (0%)	454 (5%)	181 (2%)	899 (9%)	2,431 (25%)	5,918 (60%)	9,887 (100%)
Total	142 (0%)	27,008 (17%)	7,381 (5%)	31,097 (20%)	69,944 (45%)	20,248 (13%)	155,820 (100%)

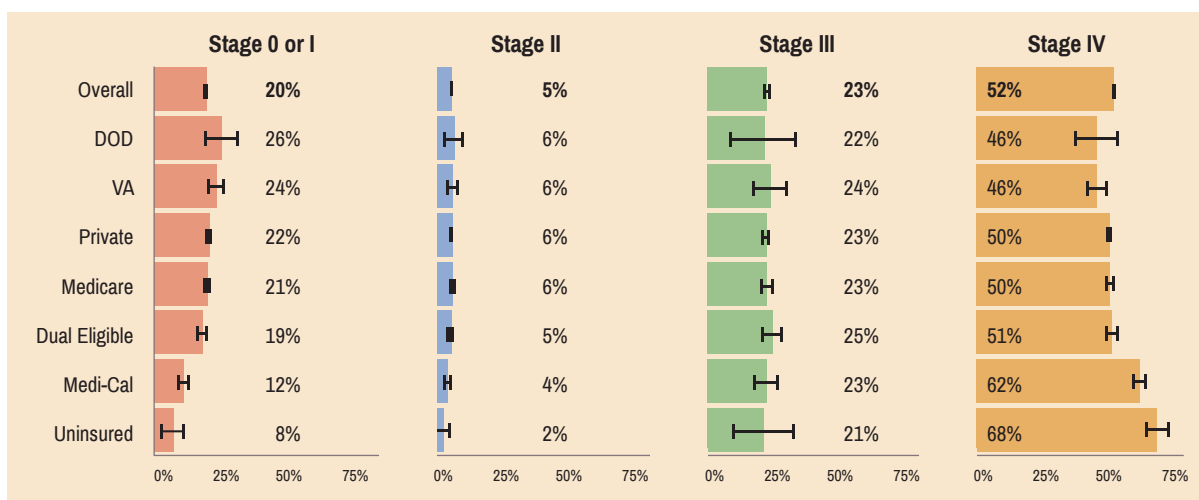
Note: Row percentages may not always add to 100 due to rounding.

Percentages cited in the text exclude unknown/other values and may not match those in the table.

Data Source: California Cancer Registry, California Department of Public Health

Prepared by the California Cancer Reporting and Epidemiologic Surveillance (CalCARES) Program, Institute for Population Health Improvement, UC Davis Health System

Figure 16. Percentage of Lung Cancer Cases by Stage at Diagnosis and Payer Source: California 2004-2012



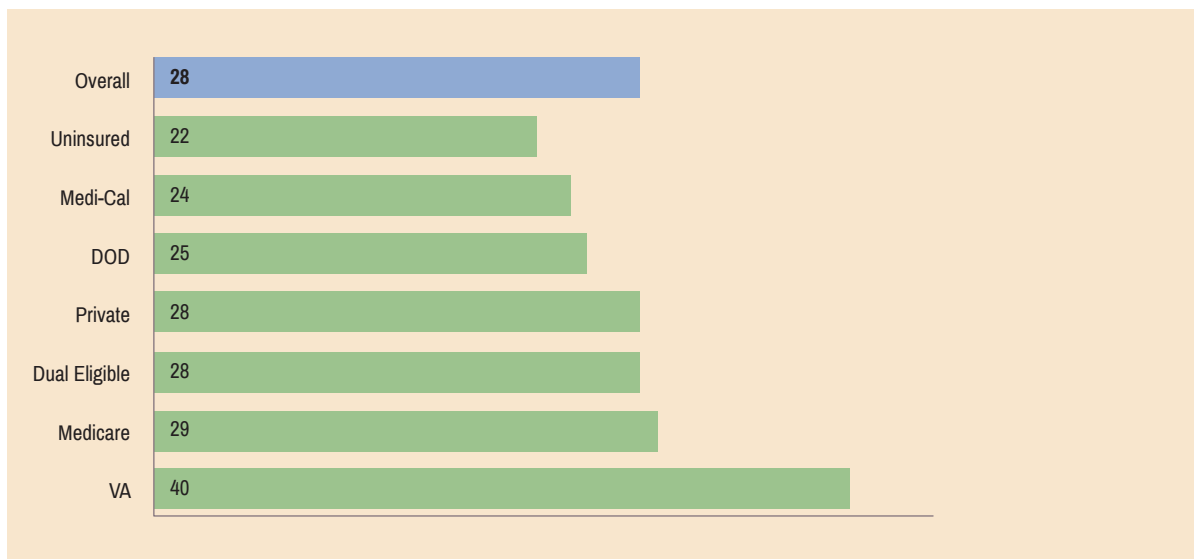
—|—: 95% confidence interval

Individuals with unknown/other payer or unknown stage were excluded from the analysis.

Data Source: California Cancer Registry, California Department of Public Health

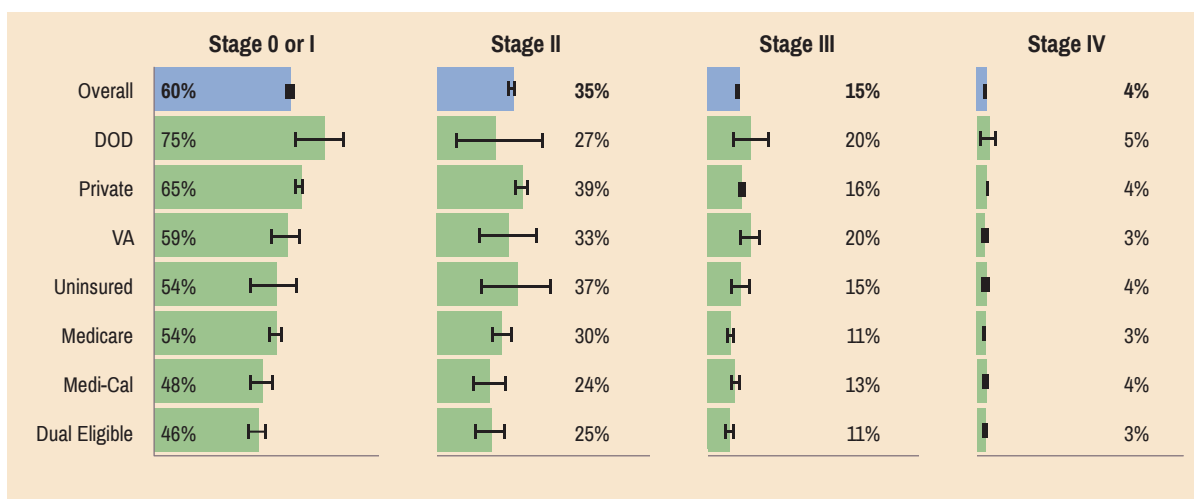
Prepared by the California Cancer Reporting and Epidemiologic Surveillance (CalCARES) Program, Institute for Population Health Improvement, UC Davis Health System

Figure 17. Median Number of Days between the Diagnosis and Initial Treatment for Lung Cancer by Payer Source: California, 2004-2012



Data Source: California Cancer Registry, California Department of Public Health
 Prepared by the California Cancer Reporting and Epidemiologic Surveillance (CalCARES) Program, Institute for Population Health Improvement, UC Davis Health System

Figure 18. Five-Year Relative Survival among Lung Cancer Cases by Payer Source and AJCC Stage at Diagnosis: California 2004-2012



—|: 95% confidence interval

Data Source: California Cancer Registry, California Department of Public Health
 Prepared by the California Cancer Reporting and Epidemiologic Surveillance (CalCARES) Program, Institute for Population Health Improvement, UC Davis Health System

Prostate Cancer

During the study period, 198,043 men with prostate cancer were reported to the CCR (Table 6). After exclusion of 15,029 patients for whom type of health insurance was not known, data from 183,014 (92.4%) were used to evaluate stage at diagnosis, five-year relative survival, and interval to treatment. As with lung cancer, CCR data were not sufficiently detailed to address any of the current CoC quality of care measures.

Results were as follows:

- Prostate cancer is now usually diagnosed at an early stage when the prognosis is highly favorable. More than 80% of prostate cancers were diagnosed at stages I or II for all sources of health insurance except for uninsured (75%) and Medi-Cal (74%) patients.
- Disparities in the frequency of patients diagnosed with late stage prostate cancer (stage IV) were found (Figure 19 and Table 6). Medi-Cal patients were diagnosed with stage IV or metastatic prostate cancer more than three times as often as patients with private insurance (18.6% and 5.6%, respectively) a highly significant difference. Patients with DOD coverage were diagnosed with stage IV disease at the same frequency (5.7%) as those with private insurance. Similar to Medi-Cal, a significantly higher percentage of uninsured patients (15.9%) were diagnosed with late stage disease than those with private insurance, DOD, or Medicare.
- Patients with Medicare-Medi-Cal dual eligibility had the shortest median interval to treatment (52 days), while VA patients had the longest interval to treatment (77 days) (Figure 20). Importantly, the interval to treatment is harder to interpret for prostate cancer than most other cancers because of the controversies around treatment options, which may make the choice for both patients and providers more difficult.
- Relative 5-year survival for prostate cancers diagnosed at stages I-III disease is now almost 100%, which means these patients are more likely to die from causes other than prostate cancer. Not surprisingly, no disparities in survival were noted among patients diagnosed with non-metastatic prostate cancer (Figure 21).
- Significant disparities in 5-year relative survival were found among persons diagnosed with stage IV prostate cancer. Five-year relative survival for metastatic prostate cancer was highest (70%) for DOD patients (although there were only 74 patients in this group). Survival was lowest for Medi-Cal patients (37%), although this was significantly lower only when compared to VA, DOD, and privately insured patients.

Table 6: Prostate Cancer Stage at Diagnosis by Payer Source

Payer	I n (%)	II n (%)	III n %	IV n %	Unknown n (%)	Total n (%)
Medi-Cal	299 (6%)	3,156 (61%)	343 (7%)	867 (17%)	499 (10%)	5,164 (100%)
Dual Eligible	449 (6%)	5,317 (66%)	519 (6%)	848 (10%)	975 (12%)	8,108 (100%)
Medicare	2,709 (8%)	22,876 (69%)	2,102 (6%)	2,760 (8%)	2,538 (8%)	32,985 (100%)
Private	10,594 (8%)	91,132 (73%)	10,089 (8%)	7,215 (6%)	6,402 (5%)	125,432 (100%)
DOD	144 (10%)	1,024 (71%)	141 (10%)	79 (5%)	57 (4%)	1,445 (100%)
VA	551 (9%)	4,611 (73%)	460 (7%)	568 (9%)	156 (2%)	6,346 (100%)
Other	98 (8%)	795 (64%)	69 (6%)	163 (13%)	112 (9%)	1,237 (100%)
Uninsured	153 (7%)	1,448 (63%)	182 (8%)	337 (15%)	177 (8%)	2,297 (100%)
Unknown	1,116 (7%)	5,339 (36%)	289 (2%)	522 (3%)	7,763 (52%)	15,029 (100%)
Total	16,113 (8%)	135,698 (69%)	14,194 (7%)	13,359 (7%)	18,679 (9%)	198,043 (100%)

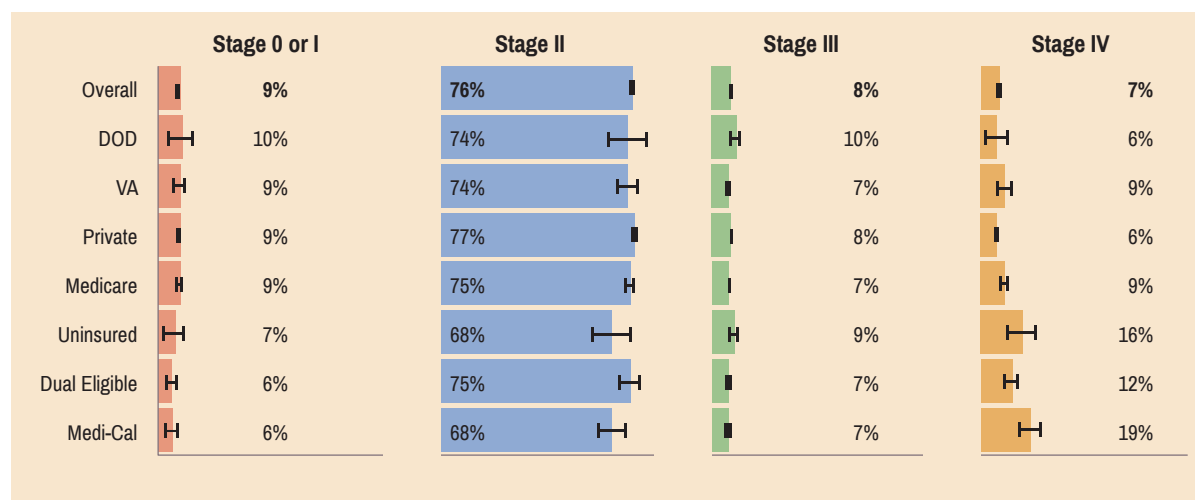
Note: Row percentages may not always add to 100 due to rounding.

Percentages cited in the text exclude unknown/other values and may not match those in the table.

Data Source: California Cancer Registry, California Department of Public Health

Prepared by the California Cancer Reporting and Epidemiologic Surveillance (CalCARES) Program, Institute for Population Health Improvement, UC Davis Health System

Figure 19. Percentage of Prostate Cancer Cases by Stage at Diagnosis and Payer Source: California 2004-2012



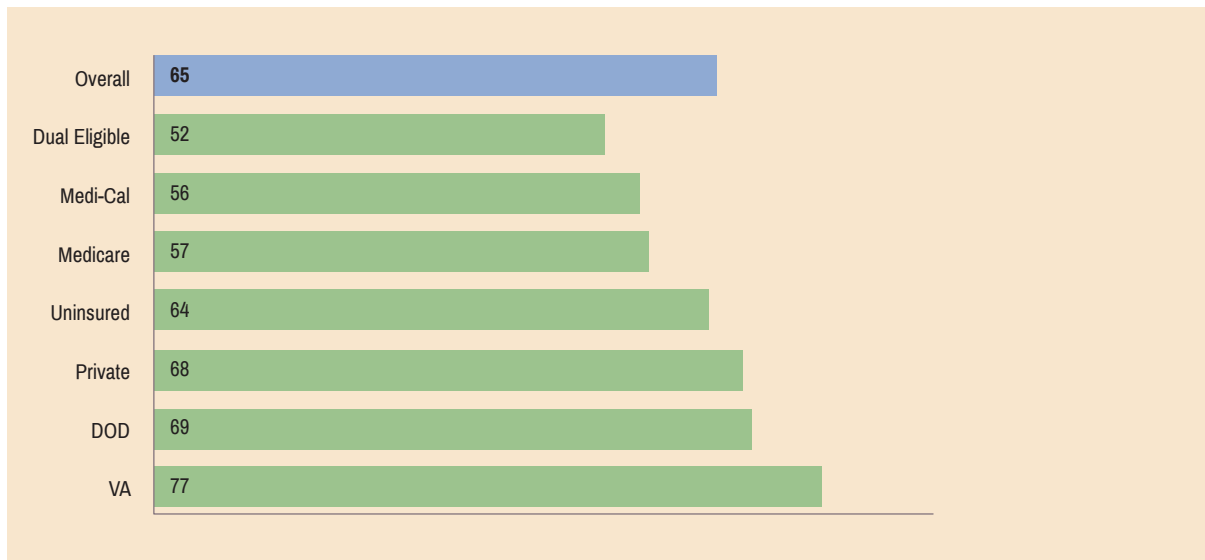
—|—: 95% confidence interval

Individuals with unknown/other payer or unknown stage were excluded from the analysis.

Data Source: California Cancer Registry, California Department of Public Health

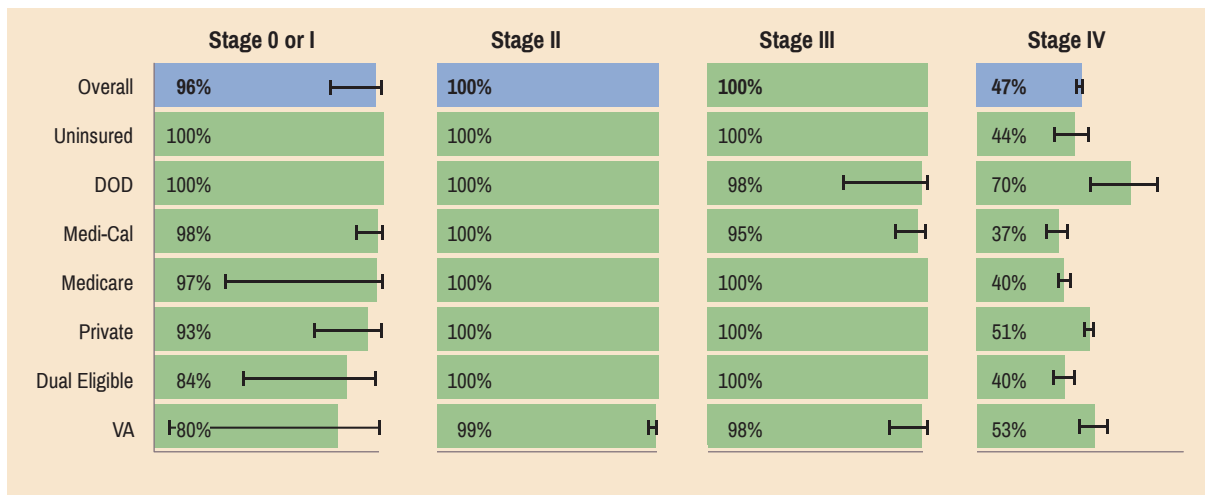
Prepared by the California Cancer Reporting and Epidemiologic Surveillance (CalCARES) Program, Institute for Population Health Improvement, UC Davis Health System

Figure 20. Median Number of Days between the Diagnosis and Initial Treatment for Prostate Cancer by Payer Source: California, 2004-2012



Data Source: California Cancer Registry, California Department of Public Health
 Prepared by the California Cancer Reporting and Epidemiologic Surveillance (CalCARES) Program, Institute for Population Health Improvement, UC Davis Health System

Figure 21. Five-Year Relative Survival among Prostate Cancer Cases by Payer Source and AJCC Stage at Diagnosis: California 2004-2012



—|: 95% confidence interval

Data Source: California Cancer Registry, California Department of Public Health
 Prepared by the California Cancer Reporting and Epidemiologic Surveillance (CalCARES) Program, Institute for Population Health Improvement, UC Davis Health System



DISCUSSION

Substantial and diverse disparities in stage at diagnosis, quality of care, and outcomes were found among cancer patients having different sources of health insurance in California during the nine-year period 2004 through 2012. In general, patients having Medi-Cal coverage, Medicare-Medi-Cal dual eligibility, or no health insurance were diagnosed at more advanced stages of disease, received lower quality care, and had poorer outcomes than persons having private insurance or insurance coverage through Medicare, VA or DOD. However, the disparities were not uniform and type-specific disparities were observed across the categories of health insurance.

Significantly larger proportions of Medi-Cal patients with breast, colon and rectal cancers were diagnosed at an advanced stage of disease compared to patients with other sources of health insurance. Medi-Cal members also had generally less favorable 5-year relative survival rates. For some cancer types and stages, survival rates of Medi-Cal and Medicare patients were similar, although the Medicare population is older than the Medi-Cal population, so one might a priori expect the Medi-Cal population to have more favorable outcomes. (These comparisons excluded Medicare-Medi-Cal dual eligible patients.) The observed findings are consistent with previous studies which have reported poorer survival and higher proportions of late stage at diagnosis among Medicaid recipients across several cancer types.⁸⁻¹⁰ In light of the substantial annual Medi-Cal expenditures for cancer care, the finding that Medi-Cal patients fared no better than uninsured persons for multiple outcomes is troubling and warrants expeditious further investigation.

Significantly larger proportions of Medi-Cal patients with breast, colon and rectal cancers were diagnosed at an advanced stage of disease compared to patients with other sources of health insurance.

VA patients did better across most quality of care measures than persons with other types of insurance.

Significant treatment and outcome disparities were found between Medicare-Medi-Cal dual eligibles and those with other types of insurance. Dual eligible patients had the lowest proportions of recommended treatment of breast cancer with radiotherapy and of colon cancer with adjuvant chemotherapy. Likewise, dual eligible patients with colon cancer were less likely to have recommended pathological examination of lymph nodes. The Medicare-Medi-Cal dual eligible population is older and more socio-economically disadvantaged than California's general population, so finding less favorable outcomes in this population is not entirely unexpected. Studies conducted in other states have reported similar unfavorable treatment and survival outcomes among breast, lung, and colorectal cancer patients among dual eligible Medicare-Medicaid patients.^{8, 11-13} The reasons for the observed differences in quality of treatment for this population could not be determined from CCR data and requires further investigation using additional data sources.

Cancer patients getting treatment by VA generally waited longer for initial treatment than persons with other sources of health insurance; however, their outcomes were comparable to or, in some cases, better than persons having other sources of health insurance. VA patients did better across most quality of care measures than persons with other types of insurance. Women with VA coverage were most likely to have recommended radiotherapy following breast-conserving surgery. Almost all VA patients with colon cancer received recommended adjuvant chemotherapy during the first course of treatment, and VA covered patients with rectal cancer were the most likely to receive recommended treatment. The reasons for the longer interval to treatment for VA patients compared to patients with other sources of insurance and for the differences in treatment could not be determined from the data in the CCR and should be further investigated.

When interpreting the results of this analysis a number of data limitations should be kept in mind. The analysis used only the payer source information available in the CCR. The quality and completeness of this information varies by type of insurance. Particular concerns exist with regard to Medi-Cal. One previous validation study of payer source data in the CCR database reported poor sensitivity of the Medi-Cal information (48%), but good specificity (98%).¹⁴ Given these results, it would be reasonable to assume that Medi-Cal coverage is underestimated in the CCR. The effect of undercounting Medi-Cal coverage in the CCR cannot be predicted with certainty, although it may well diminish actual differences in outcomes between Medi-Cal and other insurers. That is, the disparities observed among Medi-Cal members might be greater if Medi-Cal coverage were more completely captured in the CCR data. Further investigation should be done linking CCR data with Medi-Cal enrollment and paid claims data. Additionally, small sample sizes for some insured populations (e.g., VA and DOD) constrain the interpretation and generalizability of the results for these insurers. Further, the CCR does not contain uniformly highly reliable information regarding the timing of treatment across treatment types. In doing the analysis of quality measures, it was assumed that radiation and chemotherapy were delivered within the recommended

timeframes. If this assumption were substantially incorrect, then the observed results may have overstated the actual quality of care.

The significance of the differences in outcomes and compliance with recommended treatments were evaluated by computing confidence intervals for the observations. While many of the observed differences were statistically significant, for some cancers the numbers of patients covered by VA or DOD were so small that 95% confidence intervals around the measures were so wide that they may have masked real differences. Also, because of the variation and the lack of distributional assumptions, confidence intervals around the median number of days between diagnosis and beginning of treatment could not be obtained.

Finally, information on duration of enrollment is not available in the CCR. As a result, we were not able to ascertain whether individuals were enrolled in a given health insurance program prior to cancer diagnosis or if the diagnosis of cancer precipitated their enrollment in the program. This is particularly relevant to Medi-Cal, in which patients go on and off being covered relatively frequently. If a large proportion of cancer patients enrolled in Medi-Cal after they were diagnosed with cancer, poorer survival in this group may relate more to late stage at diagnosis or other population characteristics than quality of care and source of health insurance. In this regard, it is relevant to note that in a recently completed analysis of utilization of gene expression profiling in breast cancer patients in which CCR and Medi-Cal eligibility databases were linked, 59% of Medi-Cal members were enrolled prior to being diagnosed with breast cancer and 40% were enrolled the same month as or subsequent to their diagnosis.¹⁵

Given the magnitude of the differences in cancer outcomes and quality of care observed between Medi-Cal members and persons having other sources of health insurance, it would be prudent for the Department of Health Care Services, which administers the Medi-Cal program, to give priority to further investigating the quality and outcomes of cancer care among Medi-Cal members through linkage of CCR and Medi-Cal enrollment and paid claims data, and possibly other relevant state health care databases. This would allow for more detailed evaluation of the many factors which influence treatment and outcomes.

Overall, based on the results of this analysis, substantial opportunities for improved cancer care exist among all health insurers in California, with the greatest opportunities seeming to exist for persons covered by Medi-Cal or having Medicare-Medi-Cal dual eligibility.

Dual eligible patients had the lowest proportions of recommended treatment of breast cancer with radiotherapy and of colon cancer with adjuvant chemotherapy.

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