

# Lower mortality among married cancer patients: how much of the effect is explained by socioeconomic and health insurance status?

Scarlett Lin Gomez, Ph.D.

June 2015  
NAACCR



CANCER PREVENTION INSTITUTE  
OF CALIFORNIA

Preventing Cancer. Promoting Life.

# Authors

---

Scarlett Lin Gomez, Susan Hurley, Alison J. Canchola, Christina A. Clarke, Iona Cheng, Theresa H.M. Keegan, Sally L. Glaser, Maria Elena Martinez

Cancer Prevention Institute of California;  
Stanford Cancer Institute;  
University of California, San Diego



# Background

---

- Cancer patients who are unmarried at diagnosis have higher mortality than those who are married
- Studies have pointed to decreased social support among unmarried patients as an explanation for their worse outcome
  - Aizer et al., JCO 2014 (SEER data)
    - Males: HR = 1.3; Females: HR = 1.2
    - Editorial (Kissane): **“Marriage is as protective as chemotherapy in cancer care”** (compared to published associations for chemotherapy)

# Background

---

- However, it is unknown whether economic resources also impact this association
  - Married individuals more likely to have health insurance and are of higher SES

# Objective

---

**Assess the extent to which mortality differences between married and unmarried cancer patients are explained by neighborhood socioeconomic status or individual insurance status**



# Methods

---

- Patients: California Cancer Registry data: all 2000-2009 diagnoses of first invasive 10 most common sites of cancer-related deaths
  - N (cases) = 393,470 males; 389,697 females
- Outcomes: Follow-up through Dec 31, 2012
  - N (all-cause deaths) = 204,007 males; 182,600 females



# Methods

---

- Socioeconomic status (SES): Index based on Census 2000 or American Community Survey 2007-2011 block group data on 7 variables representing education, income, employment, poverty, occupation, rent, housing value - CA statewide quintiles
- Insurance status: Used “payer” and “payer2” variables
  - Categories: none, private only, Medicare only/Medicare & private, any public/Medicaid/Military, Unknown



# Methods

---

- **Analysis**: Multivariable Cox proportional hazards regression was utilized to estimate relative risks of all-cause mortality
  - stratified on age & stage (allowing baseline hazards to vary by levels of age & stage), and adjusted for race/ethnicity, cancer site, and treatment





## Results: Distributions\* of marital status by sex, CA, 2000-2009

Marital status	Males (n=393,470)	Females (n=389,697)
Married	275,344 (70.0%)	198,638 (51.0%)
Unmarried	118,126 (30.0%)	191,059 (49.1%)
Never married	53,220 (13.5%)	57,033 (14.6%)
Previously married	64,906 (16.5%)	134,026 (34.4%)
Separated	3,965 (1.0%)	4,624 (1.2%)
Divorced	31,765 (8.1%)	43,281 (11.1%)
Widowed	29,176 (7.4%)	86,121 (22.1%)

\* 10 most common sites of cancer deaths for males and for females

# Results: Characteristics (% distribution) of cancer cases by sex and marital status, CA, 2000-2009

Characteristic*	Males (N=393,470)		Females (N=389,697)	
	Unmarried (n=118,126)	Married (n=275,344)	Unmarried (n=191,059)	Married (n=198,638)
Age at diagnosis (yrs)				
18-29	1.6	0.2	1.3	0.7
30-39	1.9	1.0	3.0	4.9
40-49	6.9	4.7	9.5	16.6
50-59	20.6	18.7	16.5	25.6
60-69	27.6	32.5	20.1	25.1
70-79	24.9	29.7	24.6	19.4
80+	16.6	13.1	25.1	7.9

\* p(chi-sq) for all < 0.001; n/a not available or not reported

# Results: Characteristics (% distribution) of cancer cases by sex and marital status, CA, 2000-2009

Characteristic*	Males (N=393,470)		Females (N=389,697)	
	Unmarried (n=118,126)	Married (n=275,344)	Unmarried (n=191,059)	Married (n=198,638)
<b>Age at diagnosis (yrs.)</b>				
18-29	1.6	0.2	1.3	0.7
30-39	1.9	1.0	3.0	4.9
40-49	6.9	4.7	9.5	16.6
50-59	20.6	18.7	16.5	25.6
60-69	27.6	32.5	20.1	25.1
70-79	24.9	29.7	24.6	19.4
80+	16.6	13.1	25.1	7.9
<b>Race/ethnicity</b>				
Non-Hispanic White	65.0	65.9	67.3	66.4
Non-Hispanic Black	12.1	6.1	8.8	4.0
Hispanic	15.0	15.2	14.9	16.0
Asian/PI	6.2	11.2	8.2	12.9
Other/unknown	1.7	1.6	0.9	0.7
* p(chi-sq) for all < 0.001; n/a not available or not reported				

## Results: Characteristics (% distribution) of cancer cases by sex and marital status, CA, 2000-2009

Characteristic*	Males (N=393,470)		Females (N=389,697)	
	Unmarried (n=118,126)	Married (n=275,344)	Unmarried (n=191,059)	Married (n=198,638)
<b>Neighborhood SES</b>				
Quintile 1 (low)	19.6	12.1	16.0	10.9
Quintile 2	21.1	17.2	20.0	16.4
Quintile 3	21.1	20.6	21.8	20.4
Quintile 4	20.2	22.8	22.2	23.6
Quintile 5 (high)	18.1	27.3	20.0	28.8
* p(chi-sq) for all < 0.001; n/a not available or not reported				

# Results: Characteristics (% distribution) of cancer cases by sex and marital status, CA, 2000-2009

Characteristic*	Males (N=393,470)		Females (N=389,697)	
	Unmarried (n=118,126)	Married (n=275,344)	Unmarried (n=191,059)	Married (n=198,638)
<b>Neighborhood SES</b>				
Quintile 1 (low)	19.6	12.1	16.0	10.9
Quintile 2	21.1	17.2	20.0	16.4
Quintile 3	21.1	20.6	21.8	20.4
Quintile 4	20.2	22.8	22.2	23.6
Quintile 5 (high)	18.1	27.3	20.0	28.8
<b>Insurance</b>				
None	3.6	1.4	1.9	1.4
Private only	36.3	49.5	41.4	61.2
Medicare/Private	14.0	18.7	17.4	13.8
Any Public	41.3	27.2	34.9	20.5
Unknown	4.8	3.2	4.4	3.1
* p(chi-sq) for all < 0.001; n/a not available or not reported				

## Results: Characteristics (% distribution) of cancer cases by sex and marital status, CA, 2000-2009

Characteristic*	Males (N=393,470)		Females (N=389,697)	
	Unmarried (n=118,126)	Married (n=275,344)	Unmarried (n=191,059)	Married (n=198,638)
<b>Stage</b>				
Local	42.7	52.4	40.0	47.7
Regional	17.8	18.8	26.3	28.1
Distant	28.4	21.0	24.8	19.0
Unknown/n.a.	11.1	7.9	9.0	5.3

\* p(chi-sq) for all < 0.001; n/a not available or not reported

# Results: Characteristics (% distribution) of cancer cases by sex and marital status, CA, 2000-2009

Characteristic*	Males (N=393,470)		Females (N=389,697)	
	Unmarried (n=118,126)	Married (n=275,344)	Unmarried (n=191,059)	Married (n=198,638)
<b>Stage</b>				
Local	42.7	52.4	40.0	47.7
Regional	17.8	18.8	26.3	28.1
Distant	28.4	21.0	24.8	19.0
Unknown/n.a.	11.1	7.9	9.0	5.3
<b>Surgery</b>				
Yes	35.1	43.5	64.1	76.9
No	60.4	52.8	32.8	20.4
n/a	4.5	3.7	3.1	2.7
* p(chi-sq) for all < 0.001; n/a not available or not reported				

# Results: Characteristics (% distribution) of cancer cases by sex and marital status, CA, 2000-2009

Characteristic*	Males (N=393,470)		Females (N=389,697)	
	Unmarried (n=118,126)	Married (n=275,344)	Unmarried (n=191,059)	Married (n=198,638)
<b>Stage</b>				
Local	42.7	52.4	40.0	47.7
Regional	17.8	18.8	26.3	28.1
Distant	28.4	21.0	24.8	19.0
Unknown/n.a.	11.1	7.9	9.0	5.3
<b>Surgery</b>				
Yes	35.1	43.5	64.1	76.9
No	60.4	52.8	32.8	20.4
n/a	4.5	3.7	3.1	2.7
<b>Radiation</b>				
Yes	24.1	27.0	27.1	35.2
No	75.9	73.0	72.9	64.8

\* p(chi-sq) for all < 0.001; n/a not available or not reported



## Results: Relative risk of all-cause mortality associated with marital status, by sex, California

Model	Covariates in model	Hazard Ratio, 95% CI*, unmarried vs. married	
		Males (n=377,932)	Females (n=378,447)
1	Cancer site, race/ethnicity & treatment	1.27, 1.26 – 1.29	
2	Model #1 + neighborhood SES	1.24, 1.23 – 1.26	
3	Model #1 + insurance status	1.25, 1.23 – 1.26	
4	Model #1 + neighborhood SES + insurance status	1.22, 1.21 – 1.24	

\* Hazard ratios and 95% confidence intervals estimated from Cox proportional hazard models with time from diagnosis as time metric and stratified by age & stage.

## Results: Relative risk of all-cause mortality associated with marital status, by sex, California

Model	Covariates in model	Hazard Ratio, 95% CI*, unmarried vs. married	
		Males (n=377,932)	Females (n=378,447)
1	Cancer site, race/ethnicity & treatment	1.27, 1.26 – 1.29	1.19, 1.18 – 1.20
2	Model #1 + neighborhood SES	1.24, 1.23 – 1.26	1.17, 1.15 – 1.18
3	Model #1 + insurance status	1.25, 1.23 – 1.26	1.17, 1.16 – 1.18
4	Model #1 + neighborhood SES + insurance status	1.22, 1.21 – 1.24	1.15, 1.14 – 1.16

\* Hazard ratios and 95% confidence intervals estimated from Cox proportional hazard models with time from diagnosis as time metric and stratified by age & stage.

# Results: Relative risk of all-cause mortality associated with marital status, by sex, stratified by neighborhood SES and combination of insurance status and neighborhood SES, CA

	<b>Males (n=377,932)</b>	<b>Females (n=378,447)</b>
<b>Level of SES</b>	<b>Hazard Ratio, 95% CI*</b>	<b>Hazard Ratio, 95% CI*</b>
Low (Quintiles 1-3)	1.25, 1.23 – 1.26	
High (Quintiles 4-5)	1.26, 1.24 – 1.28	
<b>SES/insurance**</b>		
Low SES/low ins	1.22, 1.20 – 1.24	
Low SES/high ins	1.19, 1.17 – 1.21	
High SES/low ins	1.26, 1.23 – 1.29	
High SES/high ins	1.21, 1.19 – 1.24	

*\*Hazard ratios and 95% confidence intervals estimated from Cox proportional hazard models with time from diagnosis as time metric, stratified by age & stage, and adjusted for cancer site, race/ethnicity, and treatment.*

*\*\*Level of insurance status: low=none, any public/Medicaid, unknown; high=private only, Medicare only/Medicare and private.*

# Results: Relative risk of all-cause mortality associated with marital status, by sex, stratified by neighborhood SES and combination of insurance status and neighborhood SES, CA

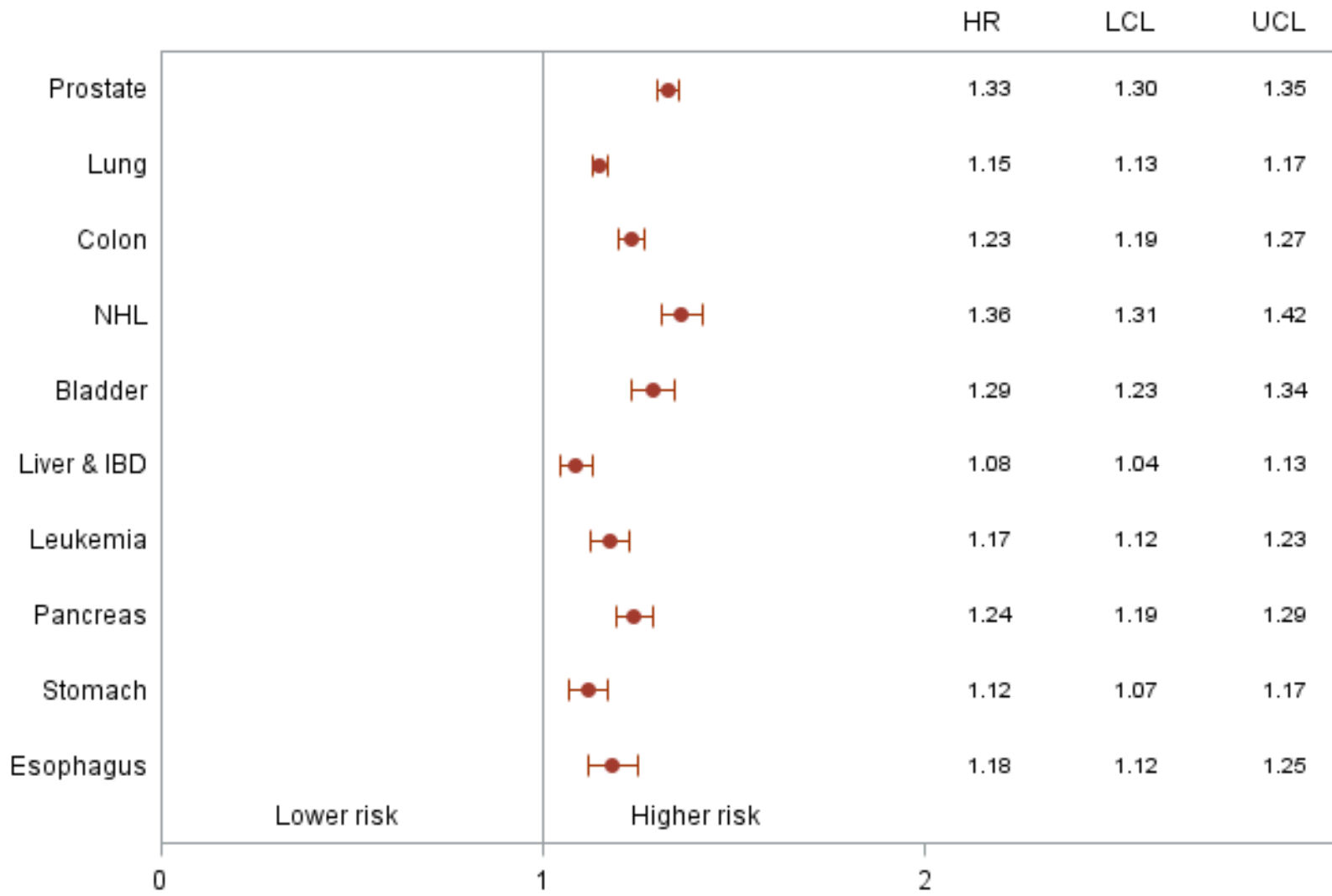
	<b>Males (n=377,932)</b>	<b>Females (n=378,447)</b>
<b>Level of SES</b>	<b>Hazard Ratio, 95% CI*</b>	<b>Hazard Ratio, 95% CI*</b>
Low (Quintiles 1-3)	1.25, 1.23 – 1.26	1.17, 1.15 – 1.18
High (Quintiles 4-5)	1.26, 1.24 – 1.28	1.18, 1.16 – 1.19
<b>SES/insurance**</b>		
Low SES/low ins	1.22, 1.20 – 1.24	1.15, 1.12 – 1.17
Low SES/high ins	1.19, 1.17 – 1.21	1.13, 1.11 – 1.15
High SES/low ins	1.26, 1.23 – 1.29	1.19, 1.16 – 1.22
High SES/high ins	1.21, 1.19 – 1.24	1.14, 1.12 – 1.16

*\*Hazard ratios and 95% confidence intervals estimated from Cox proportional hazard models with time from diagnosis as time metric, stratified by age & stage, and adjusted for cancer site, race/ethnicity, and treatment.*

*\*\*Level of insurance status: low=none, any public/Medicaid, unknown; high=private only, Medicare only/Medicare and private.*

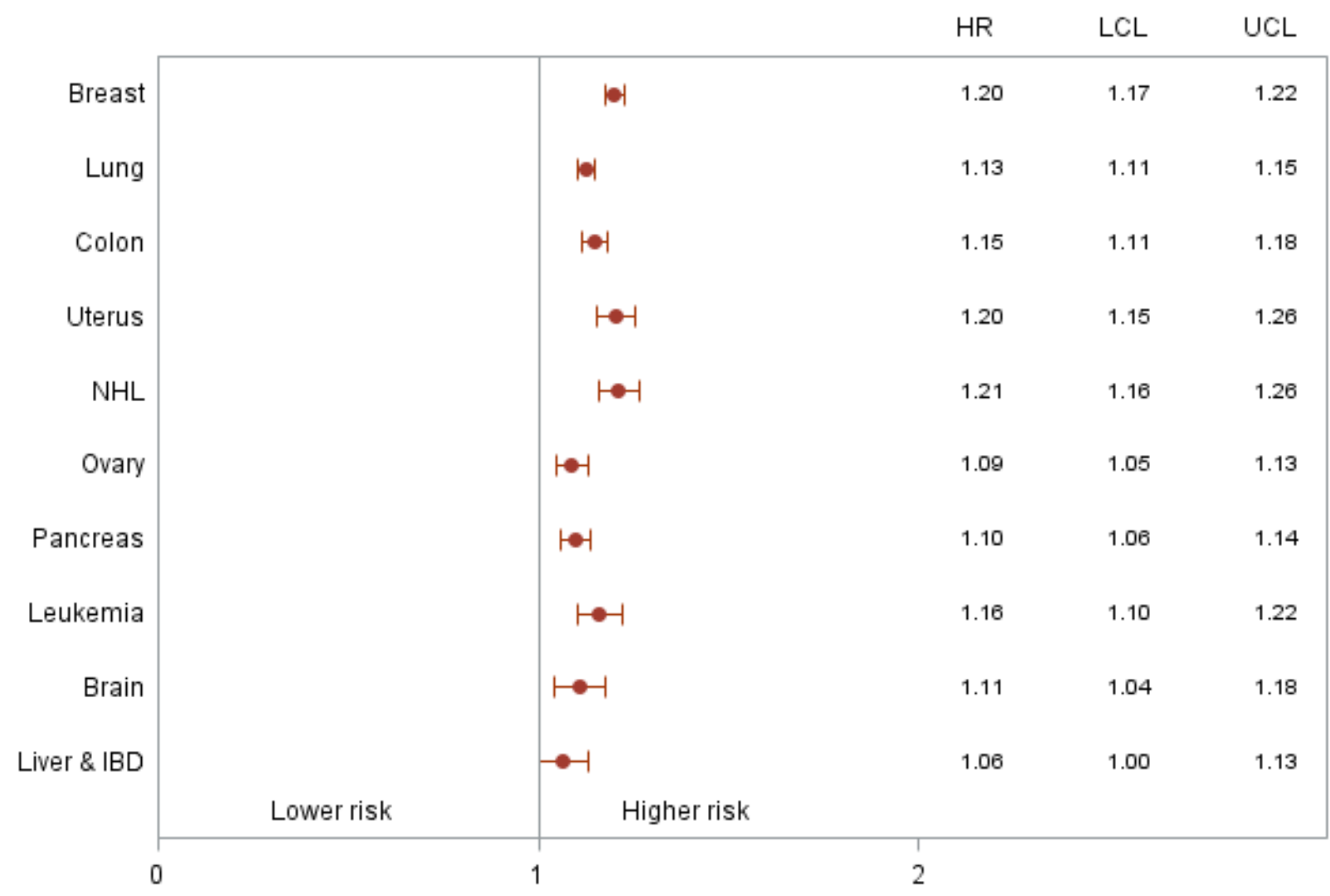
# Results: Relative risk of all-cause mortality associated with marital status, by cancer site, males

**Risk of All Cause Mortality for Unmarried vs Married Male, Adjusted for nSES and insurance status**



# Results: Relative risk of all-cause mortality associated with marital status, by cancer site, females

**Risk of All Cause Mortality for Unmarried vs Married  
Female, Adjusted for nSES and insurance status**



# Summary of results

---

- **Unmarried patients more likely than married to:**
  - **represent youngest (<30) and oldest (80+) ages**
  - **live in lower SES neighborhoods**
  - **be uninsured or have public insurance**
  - **be diagnosed at later stage**
  - **not receive any surgery or radiation (not adjusted)**



# Summary of results

---

- **HR (95% CI) for overall mortality (unmarried v. married):**
  - **Males: 1.27 (1.26-1.29)**
  - **Females: 1.19 (1.18-1.20)**
- **Associations marginally stronger in higher than lower SES neighborhoods, slightly lower after adjustment for insurance status**
- **Strongest associations seen among under-insured patients living in high SES neighborhoods**
- **Associations varied by cancer site**



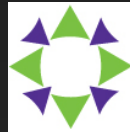


# Conclusions

---

- **Results confirm that married persons had significantly better survival after cancer, with stronger effects for men than women**
- **Effects of marital status were very minimally explained by neighborhood SES and health insurance**
- **Other factors, including social support, should be specifically evaluated to discern underlying mechanisms of marital status**
- **Further evaluation of gender differences**





CANCER PREVENTION INSTITUTE  
OF CALIFORNIA

Preventing Cancer. Promoting Life.

Thank you!

---

This research was supported in part by the  
Stanford Cancer Institute



**STANFORD**  
CANCER INSTITUTE

*Stanford University Medical Center*

A NATIONAL CANCER INSTITUTE-DESIGNATED CANCER CENTER