



Unstaged Cancer in the U.S.:

A Population Based Look at Demographic,
Socioeconomic, and Geographic Variables as Predictors
of Staging

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Background



Unstaged Studies

- Few studies have looked at the patterns of unstaged cancers
- There are no studies examining the socioeconomic or geographic patterns of unstaged cancers



Objectives

1. Examine age adjusted incidence rates for unstaged cancers, diagnosed 1992-2008
2. Describe demographic, geographical, and socioeconomic differences between people diagnosed with unstaged cancers as compared to staged cancers



Methods



Sample Description

- SEER 12 Registries
- Diagnosed 1992-2008
- SEER Historic Stage was used to define unstaged cases
- Exclude cancer sites that do not undergo staging
- Exclude cases with unknown race, ethnicity, marital status, age at diagnosis, or county of residence



Trend Analysis

- Examine the age-adjusted unstaged incidence rates
- JoinPoint Software (National Cancer Institute, 2011)
- Examine Annual Percent Change (APC)
- Identify the best fit lines of the pattern of the data
 - Overall
 - Socioeconomic differences based on county of residence
 - Site specific trends for five most common cancers



Demographic Regression Model

- Sex
- Race/ethnicity (Non-Hispanic White, Hispanic White, Black, American Indian/Alaskan Native, Asian or Pacific Islander)
- Marital status (married, single, divorced/separated, widowed)
- Age at diagnosis
- Year at diagnosis



Principal Component Analysis

- Many SES variables are correlated, but do not measure exactly the same thing
- Too many correlated variables can create confounding problems
- Combine multiple variables into one single value for analysis



Principal Component Items

- Household income
- Percent over the age of 16 without a job
- Percentage of households below 200% of the federal poverty line
- Percentage of residents over 18 with a high school diploma
- Proportion of blue collar workers
- Median household income
- Median rent
- Median house value



Full Regression Model

- Demographic information plus
 - Principal Component Quartile
 - Rural-Urban Continuum Code
 - State of diagnosis



Results

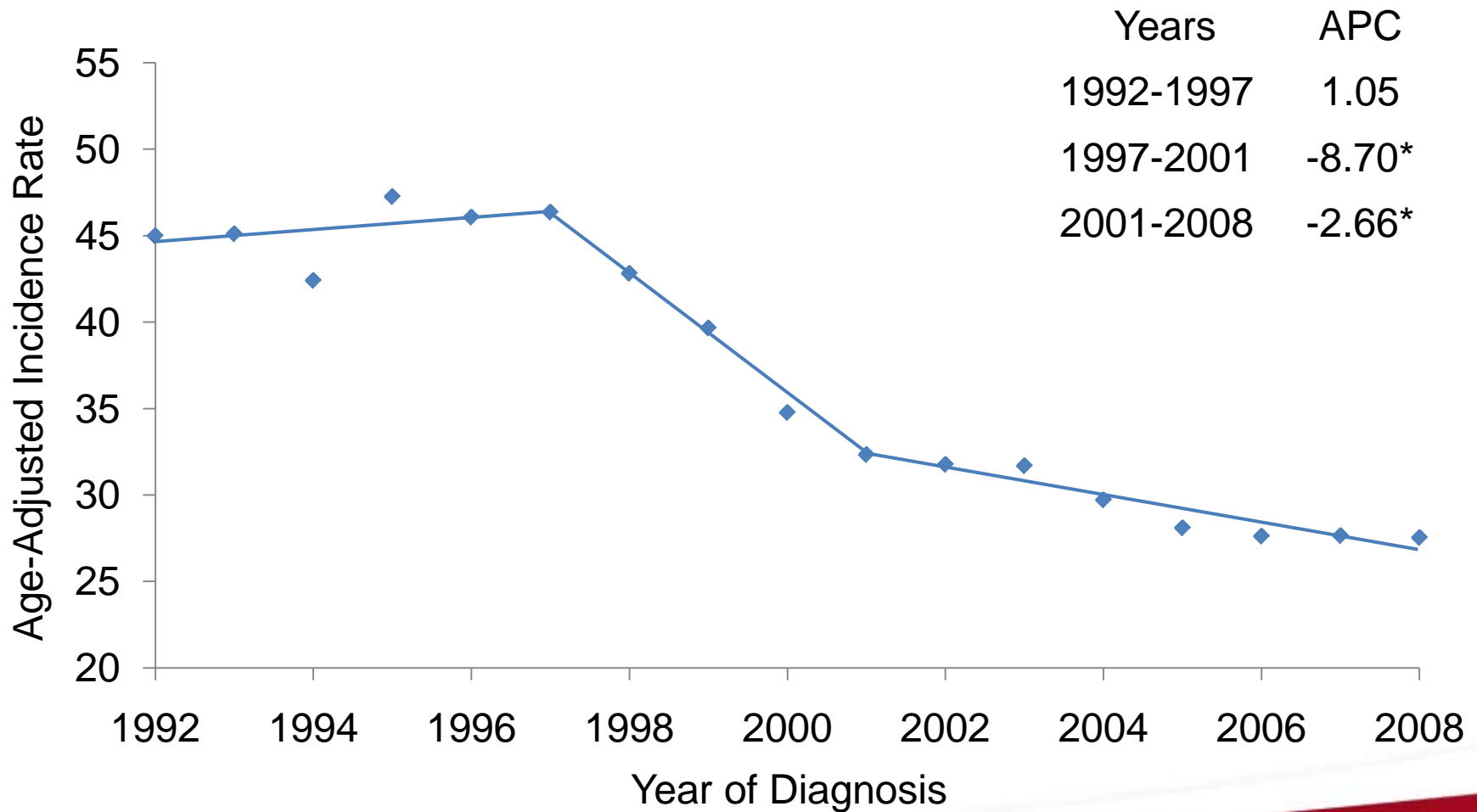


Sample Description

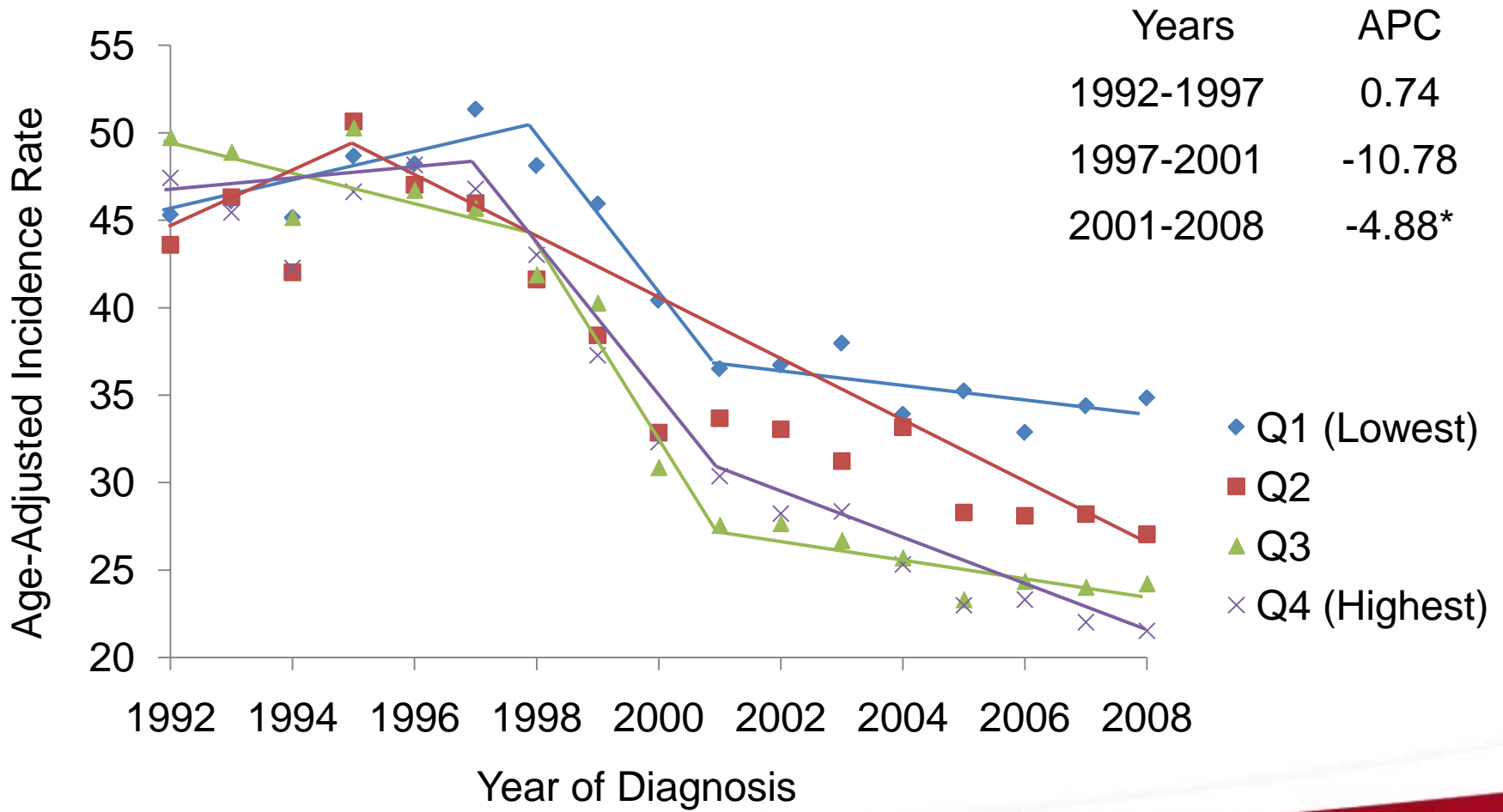
- SEER 12 cases diagnosed 1992-2008
- 2,241,829 cases after exclusions based on site and missing information
- 134,552 (6%) cases were unstaged
 - 16.76% of unstaged were Death Certificate Only or Autopsy Only



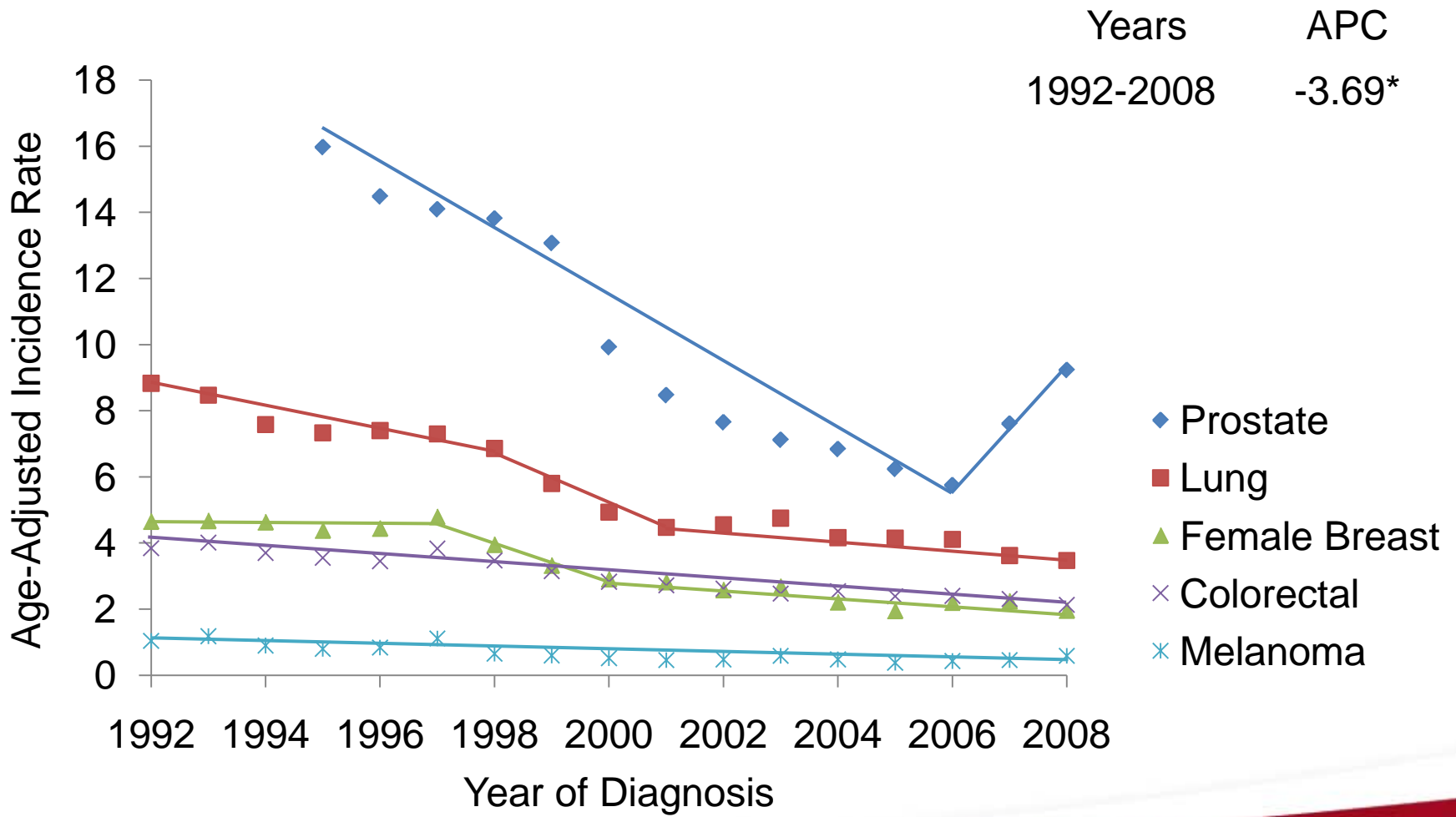
Unstaged Cancer Trends



Unstaged Cancer Trends by SES



Unstaged Cancer Trends By Site



Odds Ratio of Unstaged Compared to Staged

	Odds Ratio	Lower CI	Upper CI
Race/Ethnicity			
Non Hispanic White	1.00	Ref	
Hispanic White	1.40*	1.37	1.43
Black	1.38*	1.35	1.40
Asian/Pacific Islander	1.14*	1.11	1.16
American Indian	1.38*	1.26	1.51
Marital Status			
Married	1.00	Ref	
Divorced	1.64*	1.61	1.67
Single	1.47*	1.45	1.50
Widowed	1.58*	1.55	1.60
Sex			
Female	1.00	Ref	
Male	1.35*	1.33	1.36

	Odds Ratio	Lower CI	Upper CI
Age at Diagnosis			
<40 Years	1.00	Ref	
40-49 Years	0.98	0.94	1.02
50-59 Years	1.08*	1.04	1.13
60-69 Years	1.35*	1.30	1.40
70-79 Years	2.13*	2.06	2.21
80-89 Years	4.48*	4.32	4.65
90+ Years	11.5*	11.0	11.9
Sex			
Female	1.00	Ref	
Male	1.35*	1.33	1.36

Controlling for year of diagnosis



Odds Ratio of Unstaged Compared to Staged

	Odds Ratio	Lower CI	Upper CI
Principal Component			
Q1 (Lowest)	1.30*	1.28	1.32
Q2	1.06*	1.04	1.08
Q3	0.97*	0.96	0.99
Q4	1.00	Ref	
State of Diagnosis			
California	1.00	Ref	
Connecticut	1.42*	1.39	1.45
Georgia	1.26*	1.23	1.29
Hawaii	0.68*	0.65	0.71
Iowa	1.04*	1.01	1.07
Michigan	0.93*	0.91	0.95
New Mexico	1.26*	1.22	1.30
Utah	0.83*	0.80	0.86
Washington	0.88*	0.86	0.90

	Odds Ratio	Lower CI	Upper CI
Rural-Urban Continuum			
Metropolitan	1.00	Ref	
Urban	1.11*	1.08	1.14
Rural	1.16*	1.10	1.22
Race/Ethnicity			
Non Hispanic White	1.00	Ref	
Hispanic White	1.28*	1.25	1.31
Black	1.30*	1.28	1.33
Asian/Pacific			
Islander	1.34*	1.31	1.37
American Indian	1.25*	1.15	1.37

Controlling for sex, marital status, age at diagnosis and year of diagnosis



Site Specific Models

- Individual sites mostly followed the same pattern as the overall model, with some differences
- Female Breast
 - Rural areas increased likelihood by 52%
- Lung Cancer
 - Racial differences were no longer significant
- Prostate Cancer
 - Living in the lowest SES counties increased likelihood by 75%



Discussion



Main Messages

- Significant decrease in the rate of unstaged cancers starting around 1997
- Areas with low levels of SES have higher likelihood of unstaged cancers
- Racial differences still exist, even when controlling for SES and geography
- Older patients more likely to be unstaged – perhaps due to comorbidities



Possible Explanations

- Decrease in rate of unstaged
 - Screening has become more prevalent
 - Improvements in diagnostic and imaging procedures
- Socioeconomic Differences
 - Health disparities still exist between races
 - Areas with high SES may have better access to health care services



Other Points

- Autopsy and Death Certificate Only cases were included in these models. When excluding these cases, the values are quite similar
- Decrease in unstaged rates did not correlate to any specific changes in AJCC or EOD coding schemas



Future Research

- County level SES as is just a proxy for individual SES – Individual or census tract SES would be better
- Controlling for health insurance status may further explain some of the SES and racial differences
- Will the rate of unstaged cases continue to decrease, or will they level off?



Citations

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