

Public Health Program
College of Osteopathic Medicine
Health Professions Division



Ethnic Differences in the Treatment Outcome of Lung Cancer in Florida

Ethnic & Racial Disparities Among Patients With
Chronic Disease Panel

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Roger A. Alvarez, M.S., Michael S. Alvarez, B.S.,
Stephanie Markle, B.A., Cesar Aguiluz, B.S., Gabriel Suciú, Ph.D.

Learning Objectives

- ◆ Ethnic differences in the treatment of lung cancer.
- ◆ Effect of advance stage on ethnic differences in the treatment of lung cancer.
- ◆ Effect of histology on ethnic differences in the treatment of lung cancer.

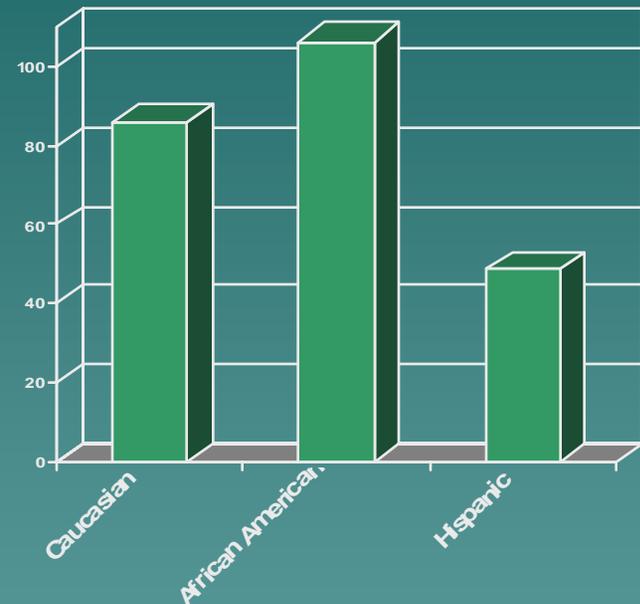
Purpose

- ◆ To address the lack of consensus regarding the cause of ethnic disparities in lung cancer treatment outcomes, we investigated different possible causes.
 - People of ethnic minority groups may be more likely than Caucasians to have a poorer prognosis at the time of diagnosis.
 - Factors such as advanced cancer stage and treatment mode, may be leading to poorer survival in minorities.

Background

- ◆ Lung cancer is a common cause of death in the United States.
- ◆ Lung and bronchus cancer remains the leading cause of cancer death in both men and women in the US.
- ◆ African-Americans have a higher mortality rate from lung cancer than do people of other ethnicities.
- ◆ Hispanics have a lower mortality rate from lung cancer than do people of other ethnicities.
- ◆ Previous studies have been equivocal regarding the cause of this disparity.

US Lung Cancer Deaths per 100,000



Mortality rate of 73.5/100,000
95% CI=(73.0, 74.0)

•(U.S. Cancer Statistics Working Group, 2005).

Research Question

Do Ethnicity, Stage and Histology modify the crude association between treatment and outcome?

Methods

- ◆ We used the Florida Cancer Registry.
- ◆ Study type:
Cross-sectional study of 21,144 patients with lung cancer diagnosed in Florida from January 1st 1995 to December 31st 2002.
- ◆ We analyzed the association between:
 - **Treatment type (i.e. exposure factor)**
 - and
 - **Vital Status (i.e. outcome)**
- ◆ Most of the patients in the registry had Non-Small Cell Lung Cancer (NSCLC), so we chose to compare the treatments that had the highest frequency in the treatment of NSCLC in the Florida Cancer Registry: **Radiotherapy and Surgery**
 - Patients who incurred **Radiotherapy** were considered **EXPOSED**, while those who underwent **Surgery** were **UNEXPOSED**.
 - Vital Status had two levels: Dead or Alive at the end of the study period.

Methods

- ◆ We used the stratified Mantel-Haenszel methodology to study the effect of the third factors:
 - Ethnicity: AAM, CAU, HIS
 - Stage: LOCALIZED (SEER 0-1) vs. ADVANCED (SEER 2-9)
 - Histology (i.e. ADEN=Adenocarcinoma; ALVE=Alveolar Carcinoma; CAR=Carcinoma; LGC=Large cell; MAL=Malignant unidentified; SMC=Small cell; SQ=Squamous cell)
- ◆ The relative risk (RR) was used for measure of association, since we dealt with cancer incident cases.
- ◆ The adjusted Mantel-Haenszel RR was used to account for confounders, while the stratum specific RR was used to establish effect modification.
- ◆ The Chi-square test of independence was used to examine the association between multiple level factors (i.e. ethnicity) and outcome/exposure.

CRUDE ASSOCIATION

Lung Cancer Treatment and Vital Status

	Vital Status		
TX type	Dead	Alive	Total
RT	7,131	2,466	9,597
SX	3,293	8,254	11,547
Total	10,424	10,720	21,144

RT = Radiotherapy; SX = Surgery; RR = Relative Risk

- **RR = 2.60**

- **95%CI=(2.52,2.68).**

- Lung cancer patients in Florida were 2.6 times more likely to be dead at the end of the 5 year period if treated with radiotherapy alone over surgery alone.

CRUDE ASSOCIATION

Lung Cancer Treatment and Vital Status

- ◆ Lung cancer patients in Florida were 2.6 times more likely to be dead at the end of the 5 year period if treated with radiotherapy alone over surgery alone.
- ◆ This was expected because, in general, early disease may be treated with surgery.
- ◆ Later disease, however, or patients with early disease who cannot tolerate surgery are generally treated with radiotherapy or chemotherapy alone.

Methods

Each third factor was analyzed based on the following criteria to determine whether it is a confounder, effect modifier or risk factor:

1. Third factor associated with the outcome.
2. Third factor associated with the exposure.
3. Third factor associated with the outcome among unexposed (patients treated with surgery).

Results

	Measure of association	95%CI	Significance
Crude association	RR=2.61	(2.53, 2.69)	S
Factors			
Histology			
Adenocarcinoma	2.87	(2.72, 3.02)	S
Alveolar Carcinomas	4.06	(3.38, 4.88)	S
Carcinoma	2.04	(1.78, 1.33)	S
Large cell	2.31	(2.08, 2.57)	S
Malignant unidentified	1.06	(0.76, 1.49)	NS
Small cell	1.65	(1.42, 1.91)	S
Squamous cell	2.26	(2.15, 2.38)	S
CMH _{GA} = 3490.57, DF = 1, P < 0.0001			S
Mantel-Haenszel RR = 2.41, 95%CI = (2.34, 2.49)			S

21% change

50% change

The diagram shows a vertical double-headed arrow between the RR values 2.87 and 2.26, with a label '21% change' in a green oval pointing to the upper part of the arrow. Another vertical double-headed arrow is shown between the RR values 4.06 and 2.04, with a label '50% change' in red text to its right.

Results

	Measure of association	95%CI	Significance	
Crude association	RR=2.61	(2.53, 2.69)	S	
Factors				
STAGE				
LOCALIZED	2.79	(2.63, 2.97)	S	34% change
ADVANCED	1.83	(1.76, 1.90)	S	
CMH _{GA} = 262.52, DF=1, P<0.0001			S	
Mantel-Haenszel	2.00	1.94 - 2.07	S	
ETHNICITY				
AAM	2.49	(2.17, 2.86)	S	No signific. change
CAU	2.61	(2.53, 2.70)	S	
HIS	2.58	(2.23, 2.98)	S	
CMH _{GA} = 269.16, DF=1, P<0.0001			S	
Mantel-Haenszel	RR=2.60	95%CI = (2.52, 2.68)		S

No substantial change between the crude and the adjusted RR

Results

- ◆ Histology and stage were found to be effect modifiers of the treatment-vital status association.
- ◆ The adjusted RR for Ethnicity was not different from the crude RR (2.60~2.61), statistically Ethnicity was found not to be a confounder.

Results

- ◆ Interestingly, the effect of exposure to surgery vs radiation was not different for Hispanics and African-Americans in the ethnicity-stratified analysis, but *was* different when we sub-stratified by histology (i.e. adenocarcinoma, large cell, squamous cell).

Results

ADVA = Advanced; ADEN = Adenocarcinoma; ALVE = Alveolar Carcinoma; CAR = Carcinoma; LGC = Large cell; MAL = Malignant unidentified; SMC = Small cell; SQ = Squamous cell

Ethnicity	Stage	Histology	Tx	Dead	Alive	RR (95%CI)	Significance
African-American	ADVA	ADEN	RT	168	43	1.84 (1.43, 2.35)	S
			SR	39	51		
		LGC	RT	74	20	2.20 (1.08, 4.49)	S
			SR	5	9		
		SQ	RT	204	68	1.92 (1.40, 2.63)	S
			SR	25	39		
	Local	ADEN	RT	22	12	2.80 (1.88, 4.18)	S
			SR	30	100		
		LGC	RT	8	6	2.86 (1.22, 6.67)	S
			SR	6	24		
		SQ	RT	35	15	2.63 (1.83, 3.77)	S
			SR	29	95		

Results

Ethnicity	Stage	Histology	Tx	Dead	Alive	RR (95%CI)	Significance
Caucasian	ADVA	ADEN	RT	1560	453	1.96 (1.84, 2.09)	S
			SR	645	985		
		LGC	RT	626	127	1.66 (1.47, 1.87)	S
			SR	138	137		
		SQ	RT	1486	451	1.70 (1.59, 1.82)	S
			SR	526	641		
	Local	ADEN	RT	163	117	3.15 (2.78, 3.57)	S
			SR	533	2352		
		LGC	RT	92	34	2.91 (2.36, 2.59)	S
			SR	88	263		
		SQ	RT	288	163	2.45 (2.22, 2.71)	S
			SR	565	1605		

Results

Ethnicity	Stage	Histology	Tx	Dead	Alive	RR (95%CI)	Significance
Hispanic	ADVA	ADEN	RT	107	22	2.1 (1.69, 2.90)	S
			SR	36	60		
		LGC	RT	35	9	2.29 (1.28, 4.08)	S
			SR	8	15		
		SQ	RT	70	24	1.61 (1.21, 2.12)	S
			SR	32	37		
	Local	ADEN	RT	7	4	3.04 (1.74, 5.32)	S
			SR	27	102		
		LGC	RT	5	1	3.75 (1.47, 9.56)	S
			SR	4	14		
		SQ	RT	8	6	1.91 (1.11, 3.30)	S
			SR	29	68		

Results

- ◆ The **Hispanics** with *localized squamous cell carcinoma* had a better outcomes than **African Americans** and **Caucasians** with the same histology when all three groups received radiotherapy alone vs. surgery alone.

($RR_{HIS}=1.91$, $RR_{CAU}=2.45$, and $RR_{AAM}=2.63$)

- ◆ However, **Hispanics** with *localized large cell carcinoma* had a much poorer outcome than **African Americans** and **Caucasians** with the same histology when all three groups received radiotherapy alone vs. surgery alone.

($RR_{HIS}=3.75$, $RR_{CAU}=2.91$, and $RR_{AAM}=2.86$).

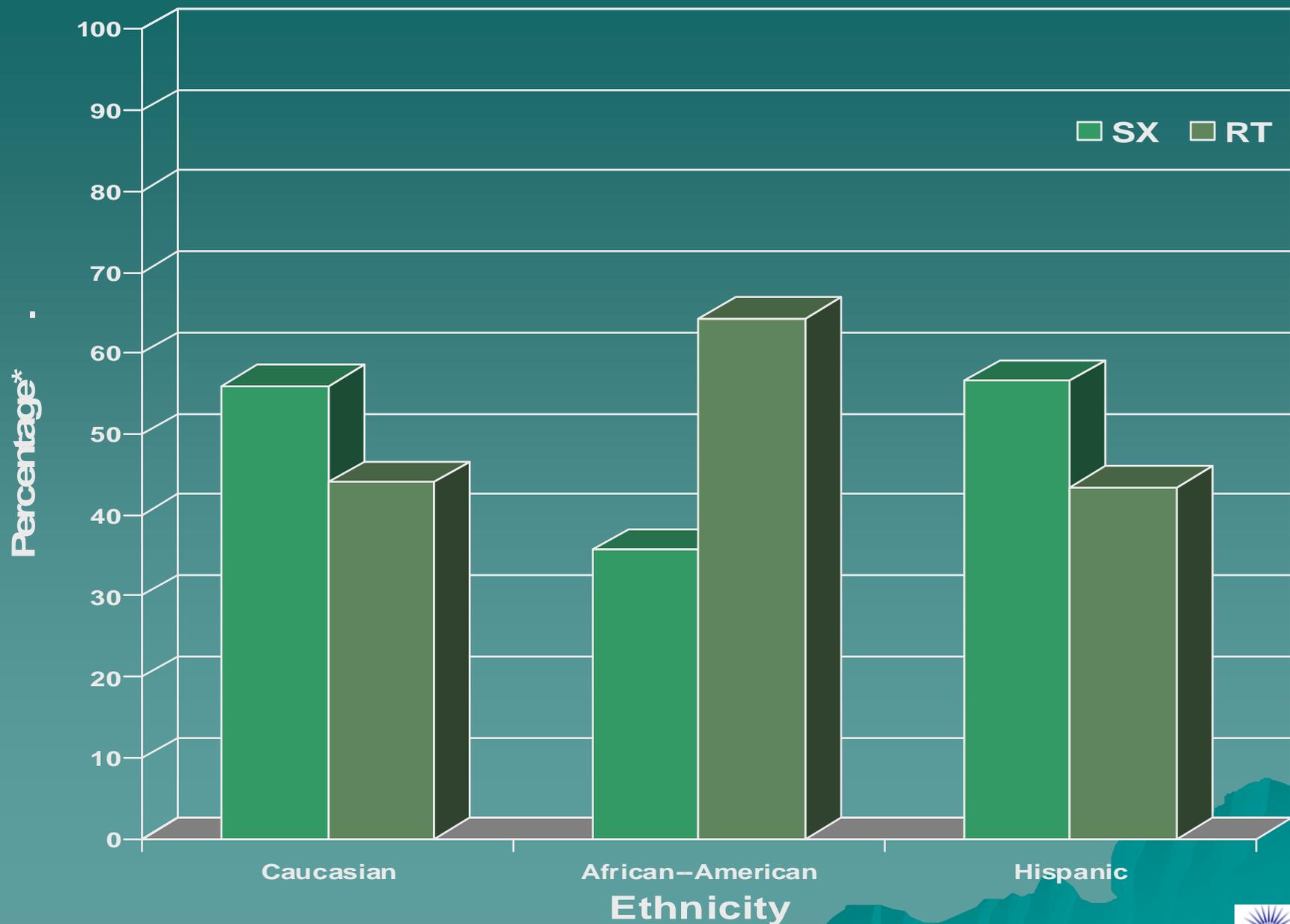
Results

- ◆ In an advanced stage of large cell carcinoma, **Caucasians** have a greater chance of positive outcome when compared to **African Americans** and **Hispanics** when treated with radiotherapy alone vs. surgery alone.
- ◆ In this situation, both ethnic minorities do not seem to respond as profoundly to treatment with radiotherapy alone as **Caucasians**.

Results

- ◆ Are persons of ethnic minority groups receiving different treatments than their Caucasian counterparts?

Lung Cancer Treatment Status by Ethnicity in Florida

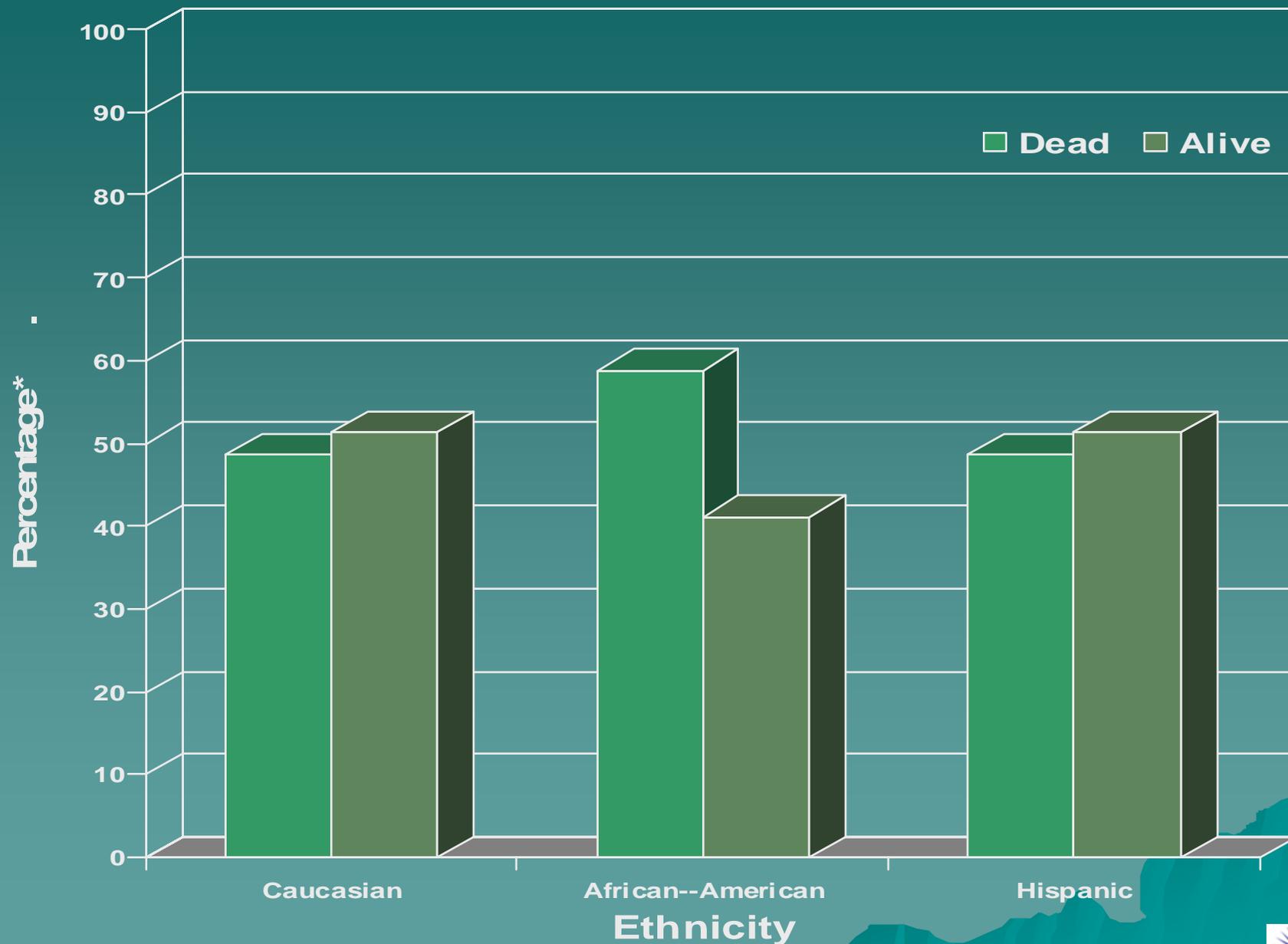


Results

35.5% of African-Americans received surgery as compared to **56%** of Caucasians and **56.5%** of Hispanics ($X^2 = 222.57, p < 0.0001$).

Significant health disparity

Lung Cancer Vital Status by Ethnicity in Florida

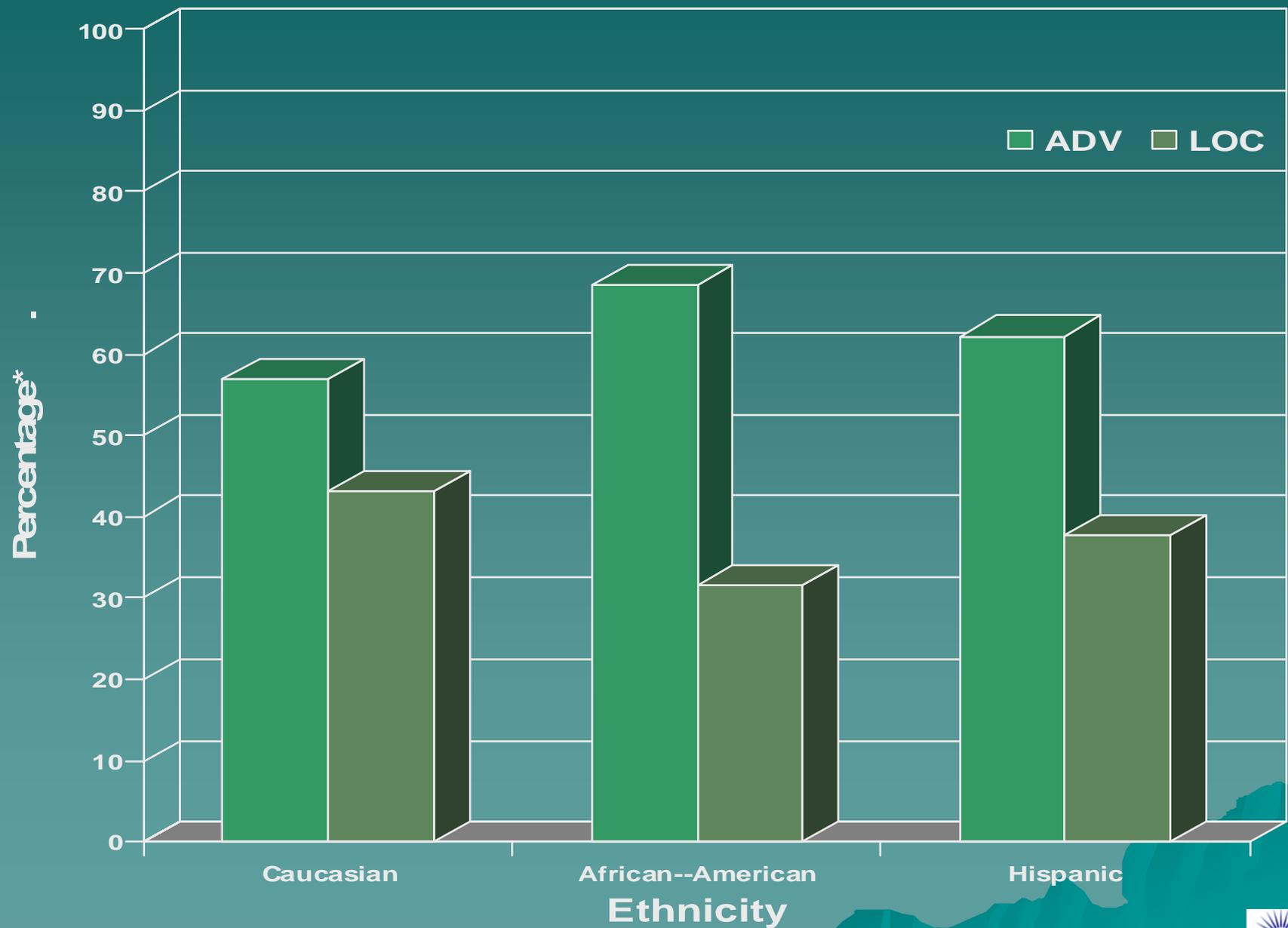


Results

African-Americans had a **58.9%** fatality rate compared to **48.6%** and **48.7%** fatality rates among Caucasians and Hispanics respectively
($X^2=56.52$, and $p < 0.0001$).

Significant health disparity

Lung Cancer Stage by Ethnicity in Florida



Results

When looking at stage of cancer at time of diagnosis against ethnicity, we found that **68.5% of African-Americans** were diagnosed at an advanced stage versus 56.9% Caucasians and 62.3% of Hispanics ($X^2 = 82.04, p < 0.0001$).

Significant health disparity

Conclusions

- ◆ African-Americans as a group were diagnosed at a later stage than other ethnic groups.
- ◆ Likely as a result of this delay of diagnosis African-Americans received surgery less often, and had the poorest overall survival rate from lung cancer.
- ◆ This may explain part of the disparity in lung cancer mortality in African-Americans.

Conclusions

- ◆ There are differences in response to treatment between persons with the same histology disease but different ethnicities.
- ◆ There may be differences in tumor biology that account for part of this difference.

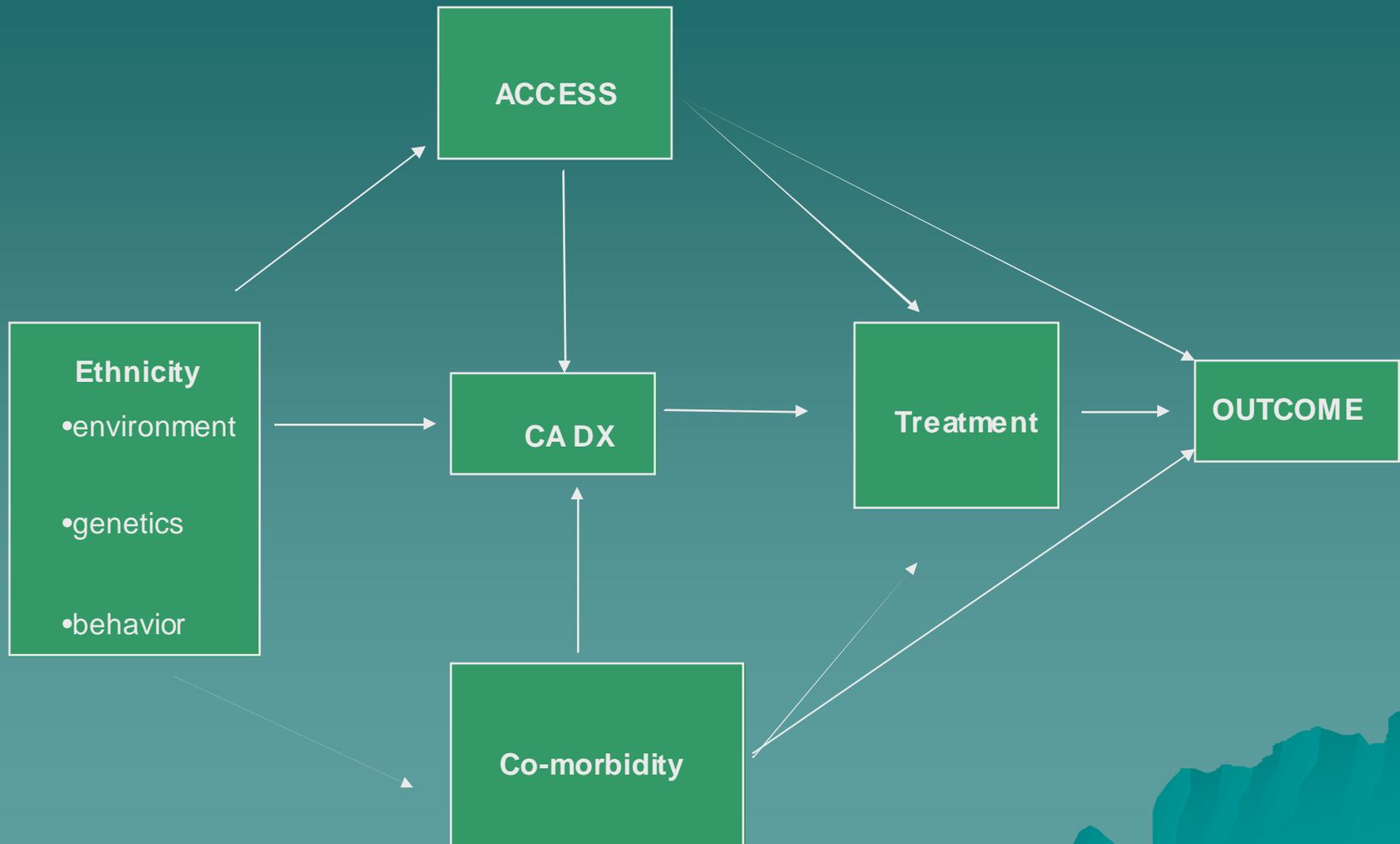
Conclusions

- ◆ The fact that African-Americans are more often diagnosed at an advanced stage may be due to the fact that they are less likely to seek medical care because of:
 - High cost
 - **Lack of health insurance**
 - Mistrust in health care professionals.
- ◆ **People who do not have health insurance may have a greater chance of being diagnosed at a later stage than those with insurance.**

Conclusions

- ◆ Even after stratifying by histology *and* stage, there remain differences in the response to treatment between different ethnic groups in certain categories of NSLC, including localized SQC as well as localized and advanced LGC.
- ◆ While the cause of these differences is unknown to us, there may be differences in either tumor or patient biology that mediate these differences.

Biopsychosocial Model of Ethnicity and Lung Cancer Treatment Outcomes



Discussion

- ◆ This model depicts the possible relationships between:
 - Ethnicity
 - Stage of diagnosis
 - Treatment outcome
- ◆ This model represents a possible explanation for the sequence of events that ultimately lead to outcome differences amongst lung cancer patients in Florida.

Limitations

- ◆ No access to chart level data on patients
- ◆ We did not control for other possible confounders such as smoking status, insurance coverage, age, co-morbidities, gender, and others. Not controlling for this data could significantly alter some of our conclusions.
- ◆ Future investigations into this topic should utilize statistical analysis that could determine which of these other variables are confounders or effects modifies and subsequently control for them in the analysis.

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