

Neighborhood-level Social Determinants and Cancer Outcomes

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**APPLYING BIG DATA TO ADDRESS THE SOCIAL DETERMINANTS OF HEALTH IN
ONCOLOGY: A NATIONAL CANCER POLICY FORUM WORKSHOP
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Background

- Social determinants (SDH) have significant impact on oncologic outcomes
- Understanding SDH allows for better understanding of the patient, their risk & needs
- Gaining access to patients individual SDH is challenging
 - Inconsistent, unreliable; sensitive; changes over time
- Area-level data are readily available and can be used as proxies for individual social and economic status while also reflecting unique contextual risk factors

Linking clinical data to publicly available data

- We have leveraged publicly available national statistics and census demographic data to determine the link between neighborhood level SDH and patient oncologic outcomes
- We gather individual clinical and demographic data – age, gender, race, histology, stage, treatment, outcomes
 - Electronic medical record (EMR)
 - Institution tumor registries
 - National cancer databases

Publicly available national statistics and census demographic data

- Address data linked to geocoded census information

- US Census



- American Community Survey



- Environmental Protection Agency

- EJScreen



- US Department of Agriculture



Publicly available national statistics database characteristics

	US Census	ACS	EJScreen	USDA
Years	2000	2013-2017	2010-2018	2010, 2015
Variables	<u>community-level data</u> : racial diversity, ethnicity, educational attainment, unemployment rate, household income, housing value, etc	<u>community-level data</u> : racial diversity, ethnicity, educational attainment, unemployment rate, household income, housing value, etc	<u>environmental data</u> : PM 2.5, ozone, traffic proximity NATA cancer risk <u>community-level data</u> : Minority pop, low income population, Less than HS edu population	Food access Low income population
How to access data	https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml	https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml	https://ejscreen.epa.gov/mapper/index.html?where	https://www.ers.usda.gov/data-products/food-access-research-atlas/go-to-the-atlas.aspx

Neighborhood-Level Socioeconomic Determinants Impact Outcomes in Nonsmall Cell Lung Cancer Patients in the Southeastern United States

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- **2000 Census and institution tumor registry**
- **Census tract**
- Income determinants: 1) the % of the population living below the poverty line & 2) the median household income of the population Education determinants: 1) the % of residents that attained at least a high school diploma and 2) the % of residents that attained at least a bachelor's degree.
- **Patients who lived in areas with high poverty levels, low median incomes, and low education levels had worse mortality**

Socioeconomic Status, Not Race, Is Associated With Reduced Survival in Esophagectomy Patients

Loretta Erhunmwunsee, MD, Brian C. Gulack, MD, Christel Rushing, MS, Donna Niedzwiecki, PhD, Mark F. Berry, MD, and Matthew G. Hartwig, MD

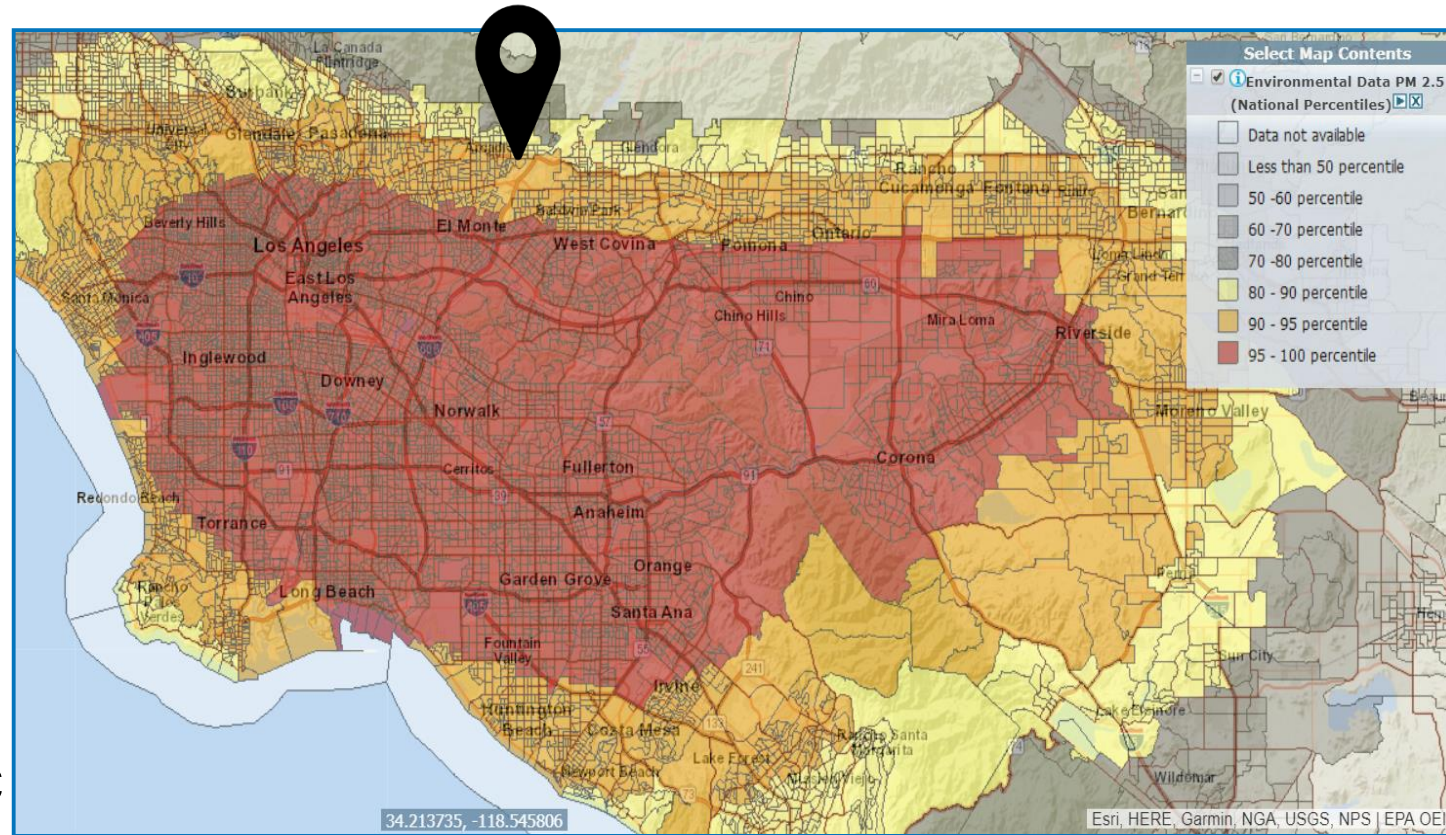
Division of Thoracic Surgery, Department of Surgery, City of Hope Cancer Center, Duarte, California; Divisions of General Cardiothoracic Surgery, Department of Surgery, and Duke Cancer Institute, Biostatistics, Duke University Medical Center, North Carolina; and Department of Cardiothoracic Surgery, Stanford Medical Center, Stanford, California

- **2000 Census/2012 ACS and National Cancer Database**
 - **Zip code**
 - Income determinant: Median household income Education determinant: Proportion of residents in zip code without a HS diploma
- Neighborhood SES significantly impacted the survival of esophagectomy patients**

Methods: EMR and EJScreen

- Participants: All adult COH patients with a primary NSCLC diagnosis from 2015-2018
- Data collection
 - Outcome: Medical Record Abstraction (MRA)
 - Exposure: EPA EJ Screen
 - Covariates: MRA + EJ Screen
- Statistical Method: Multiple Logistic Regression

COH National Medical Center



Results

Disease & Mutations:

Stage	N (%)	
I-II	107 (16%)	
III	116 (17%)	
IV	430 (63%)	
Unknown	15 (2%)	
Histology		
Adenocarcinoma	565 (82%)	
Squamous	76 (11%)	
Other	45 (7%)	
Gene	N	Pos. (%)
KRAS	535	82 (15.3)
G12c/G12v		
KRAS	537	151 (28.0)
TP53	504	287 (57.0)

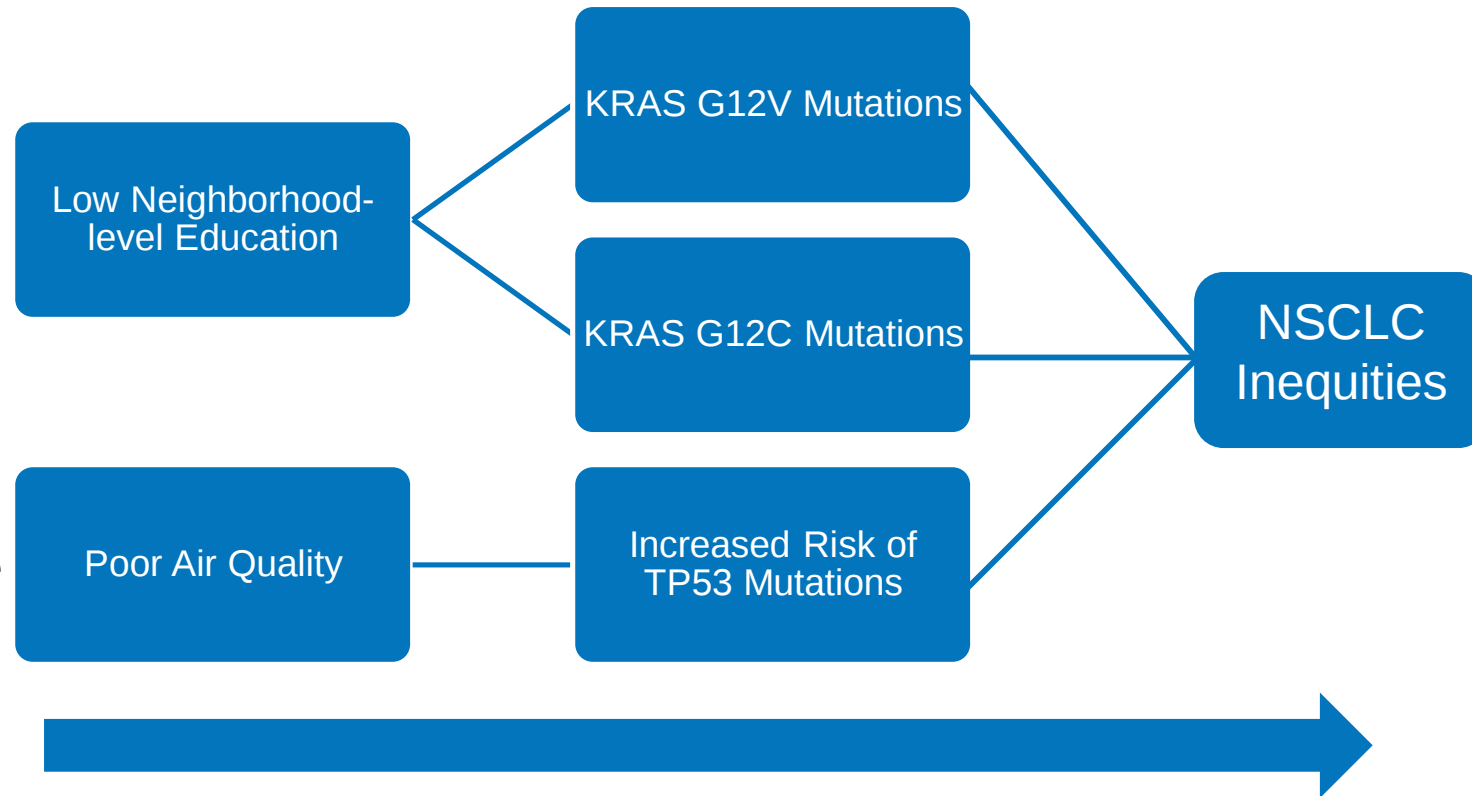
Air Pollution & Neighborhood Characteristics:

Environmental factors by EPA guidelines	N (%)
Particulate Matter (PM 2.5 in ug/m3)	
Good (0-12.0)	333 (49%)
Moderate (12.1-35.4)	347(51%)
Ozone (ppb)	
Good (0-54)	394 (58%)
Moderate (55-70)	286 (42%)

Community demographics (Census Tract)	Mean (SD)	US Average
Minority Population	60.3% (0.23)	38%
Low Income Population	29.4% (0.14)	34%
Population with < HS Edu.	14.4% (0.11)	13%

Neighborhood SDH impacts aggressive NSCLC biology

- Link between adverse neighborhood-level social determinants and aggressive biological NSCLC behavior
- Potential mechanism by which deprived NSCLC populations face worse outcomes



Limitations of neighborhood SDH

- Not individual-level
 - Some correlation between area based and individual SDH
- No standard geographical level
 - Zip code, census tract, block group
 - Which geographical level is optimal?
- Which neighborhood?
 - Childhood, longest as adult, current?

thanks
