



University of California  
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# Introduction to Social Determinants of Cancer

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 @slingomez



**Health equity** means social justice in health (i.e., no one is denied the possibility to be healthy for belonging to a group that has historically been economically/socially disadvantaged).”

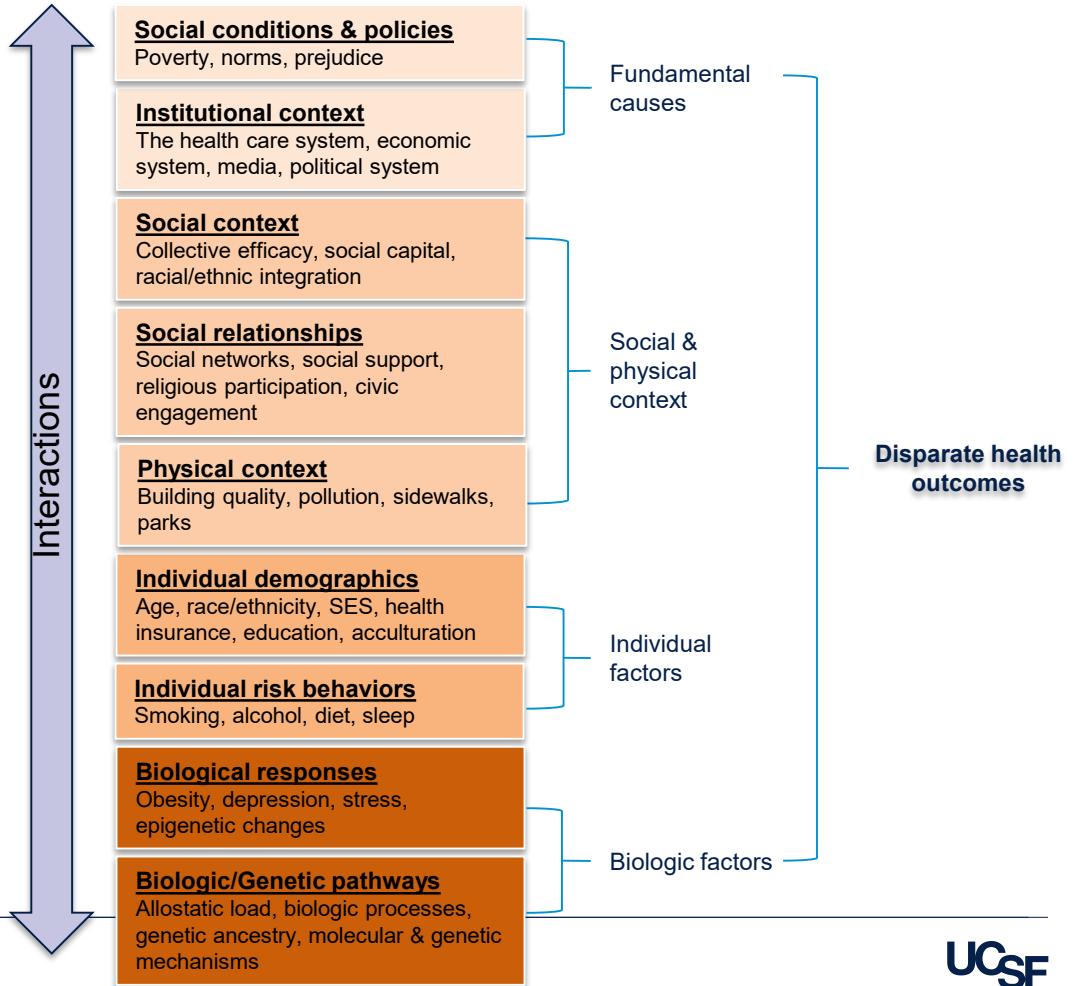
**Paula Braveman, Public Health Rep 2014**

# Cells-to-Society model

A framework for multilevel research

Centers for Population Health and  
Health Disparities, NIH

Warnecke et al. AJPH 2008

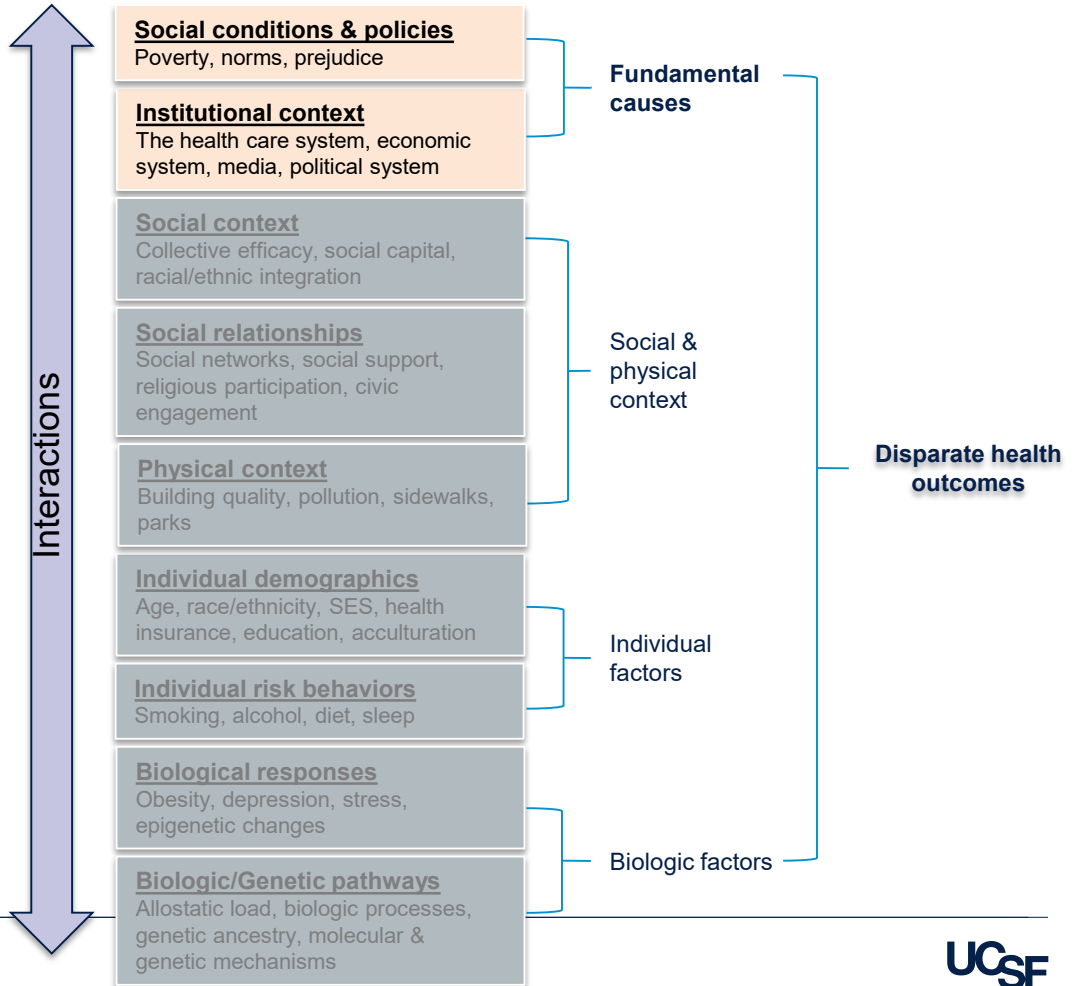


# Cells-to-Society model

## Fundamental causes

“Their roots are embedded in policy, shared social norms about health and social practices, socioeconomic disadvantage, and policies that affect public availability of health services, including who receives them and the level and quality of service. They are the determinants of inequities rather than differences.”

Warnecke et al. AJPH 2008

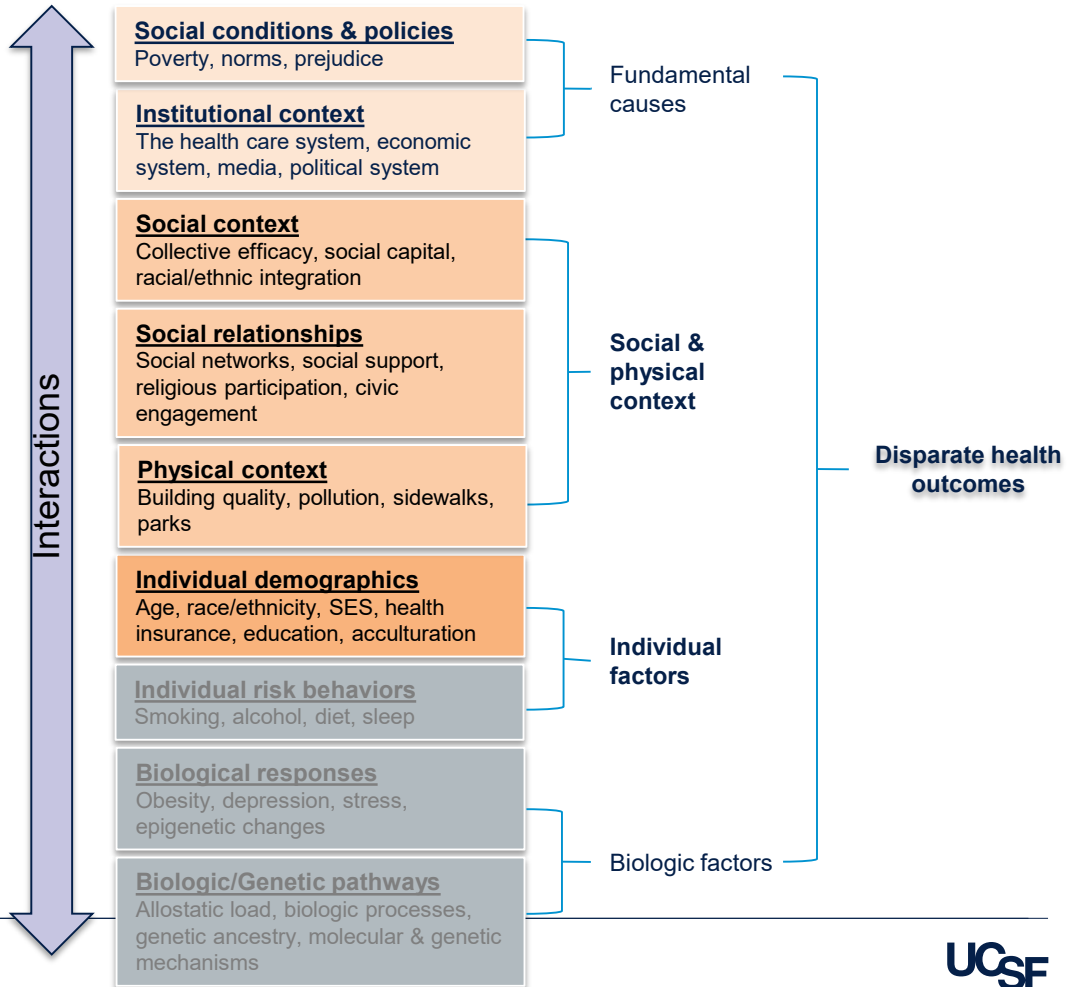


# Cells-to-Society model

## Social Determinants

Social determinant of health are the conditions in which people are born, grow, work, live, and age, and the wider set of forces and systems shaping the conditions of daily life.  
-World Health Organization

Warnecke et al. AJPH 2008



## Case Study

Prostate cancer in African American men:  
RESPOND study

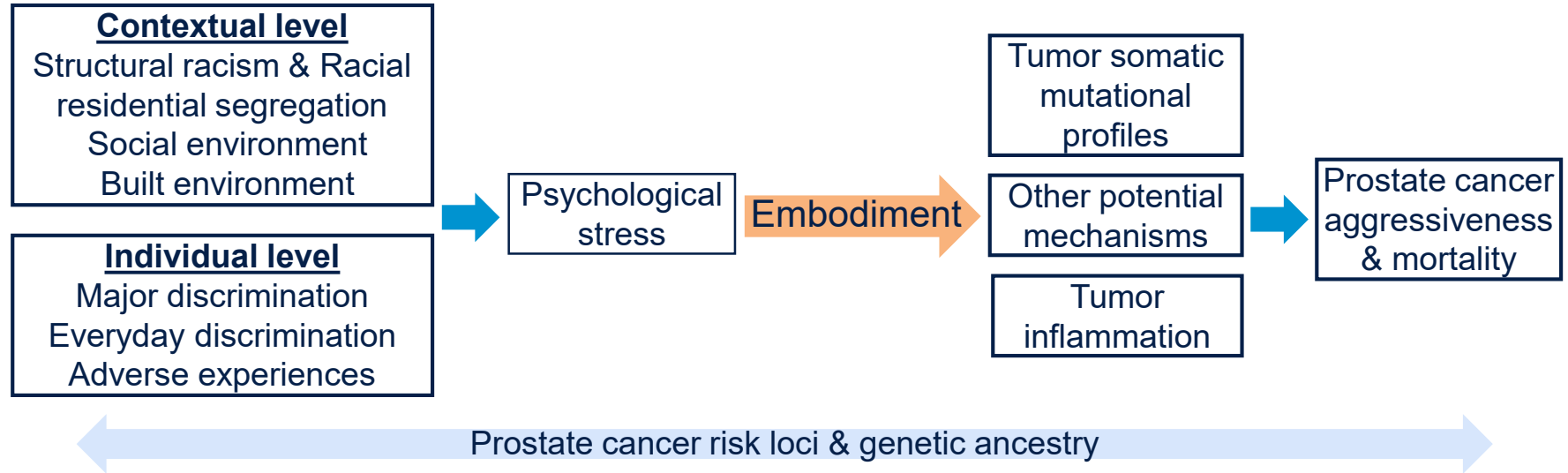
# Why prostate cancer in African American men?

Rate/100,000	African American	Non-Hispanic White	Ratio AA:NHW
Incidence	179.2	101.7	1.8
Mortality	39.8	18.1	2.2

Cancer Facts & Figures 2019

# RESPOND Project 1 Conceptual Framework

## Lifecourse social stressors



# Neighborhood-level social stressors associated with aggressive prostate cancer

- Neighborhood factors indicating social adversity (i.e., high proportion of older single heads of household (social isolation), high rates of vacant housing, high unemployment) associated with shorter time to disease progression; significant interaction between selected genotypes and neighborhood factors
  - Rebbeck et al. CEBP 2010
- SES deprivation (high poverty, low income, low education, high households without cars, and high public assistance) significantly associated with Gleason score
  - Zeigler-Johnson et al. Prostate Cancer 2011

# Biological mechanisms for stress embodiment in prostate cancer

- Stress exposure increases development of PCa tumors in transgenic mouse models
- Androgen ablation therapy in mouse model is less effective in presence of external stress stimulus; mice exposed to stress had less programmed cell death and less clearance of tumor cells
- Stress exposure produces neuroendocrine signaling effects on growth, metastasis, angiogenesis, and apoptosis, frequently through immunological mechanisms

# RESPOND Study: Prostate cancer in African American men

Addressing the role of social stressors, genetics, and tumor genomics & biology

*RESPOND is an integrated set of studies all focused on a common theme of identifying the multi-level determinants and characteristics of aggressive prostate cancer in African American men.*



# RESPOND

African American Prostate Cancer Study

U19CA214253 (Haiman, USC)



# RESPOND

African American Prostate Cancer Study

## Recruitment and research sites

CRGC  
CANCER REGISTRY OF GREATER CALIFORNIA

PUBLIC  
HEALTH  
INSTITUTE®

UCSF

University of California  
San Francisco  
advancing health worldwide

WAYNE STATE  
School of Medicine

NJHealth  
New Jersey Department of Health

RUTGERS  
Cancer Institute  
of New Jersey  
RUTGERS HEALTH

National Cancer Institute - DCEG

EMORY  
ROLLINS  
SCHOOL OF  
PUBLIC  
HEALTH

JOHNS HOPKINS  
MEDICINE  
PATHOLOGY

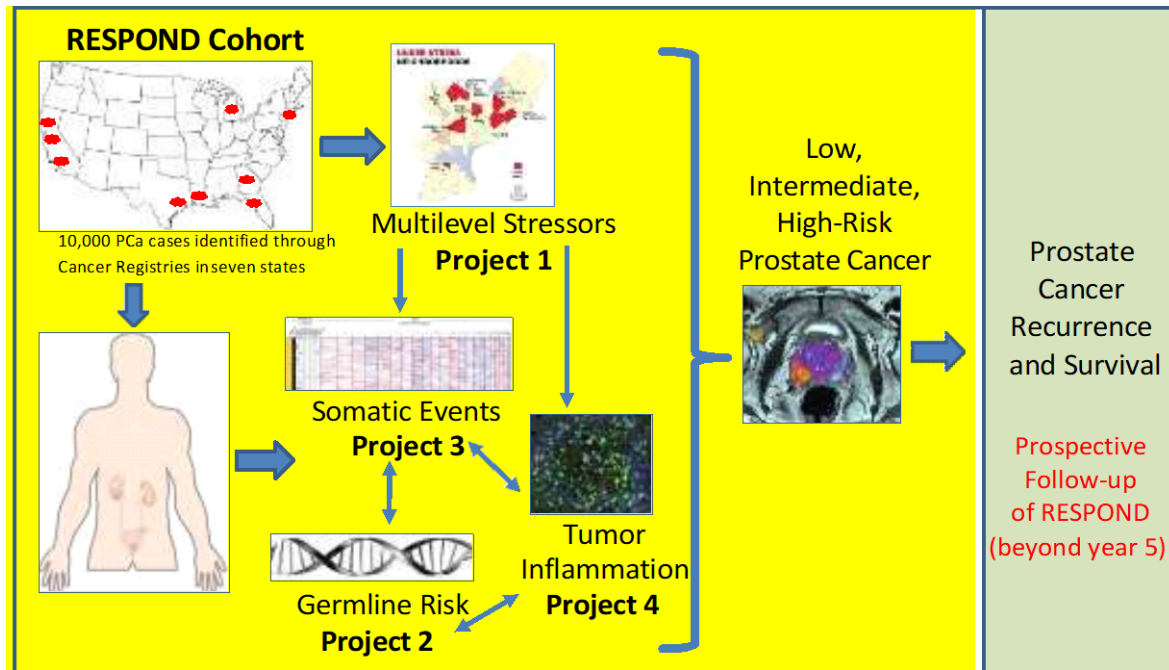
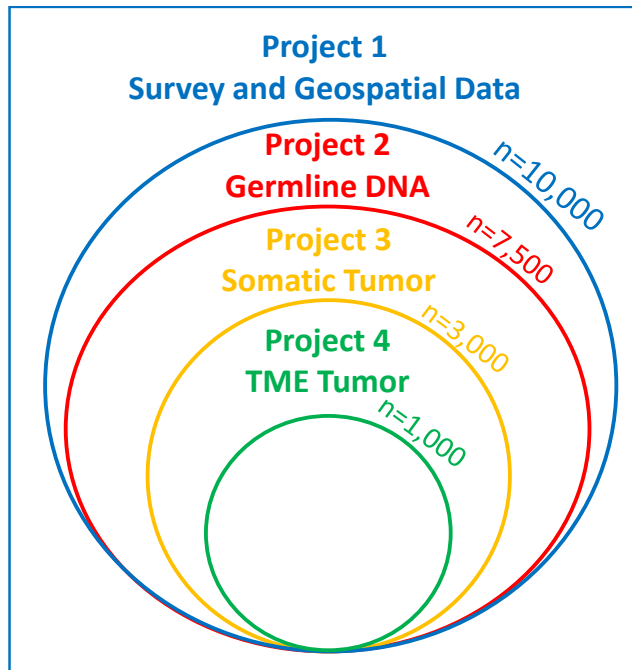
USC  
University of  
Southern California

Baylor  
College of  
Medicine

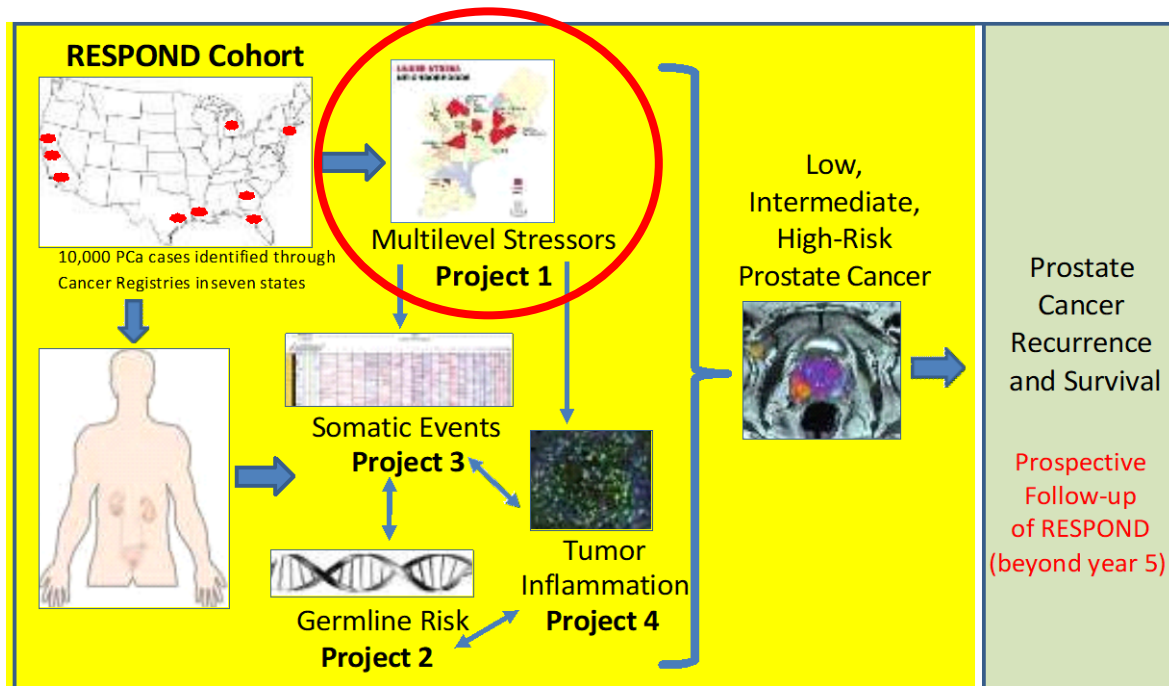
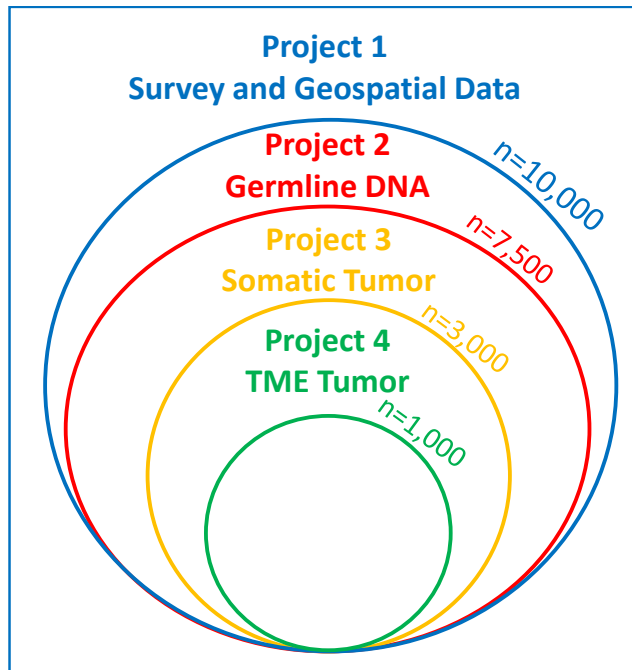
LSUHealth  
NEW ORLEANS  
School of Public Health  
Epidemiology Program - Louisiana Tumor Registry

Recruitment primarily through cancer registries

# Projects & Integration



# Projects & Integration



# Project 1 Aims

**Aim 1.** Examine associations between neighborhood social stressors and risk of aggressive prostate cancer/mortality.

Compare African American and non-Hispanic White men diagnosed in the RESPOND catchment areas by linking **geospatial neighborhood data** to **cancer registry data** and examining the associations between neighborhood social stressors and aggressive prostate cancer/risk of mortality.

# Project 1 Aims

**Aim 2.** Among 10,000 African American prostate cancer cases, examine associations between exposures to multi-level social stressors for African American men **across the lifecourse** (early, mid, adult life) and risk of aggressive prostate cancer.

## Contextual-level social stressors

- Structural racism & Racial residential segregation
- Social Environment
- Built Environment

## Individual-level social stressors

- Major discrimination
- Everyday discrimination
- Early-life adversity

# Project 1 Aims

**Aim 3.** Examine the associations between multi-level social stressors and genetic factors in association with aggressive prostate cancer.

We will assess the association between the multi-level social stressors and:

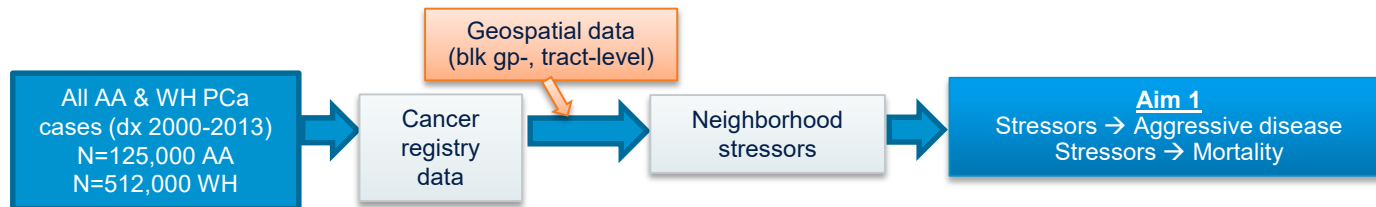
- a) Proportion of African genetic ancestry (*Project 2*)
- b) Frequency and type of somatic profiles (*Project 3*)
- c) Integration: Whether social stressors, germline genetics (including prostate cancer aggressive loci from *Project 2*), tumor inflammation (from *Project 4*), and somatic profiles (from *Project 3*) are jointly associated with risk of aggressive disease.



# RESPOND

African American Prostate Cancer Study

## Project 1 Data & Analysis Flowchart

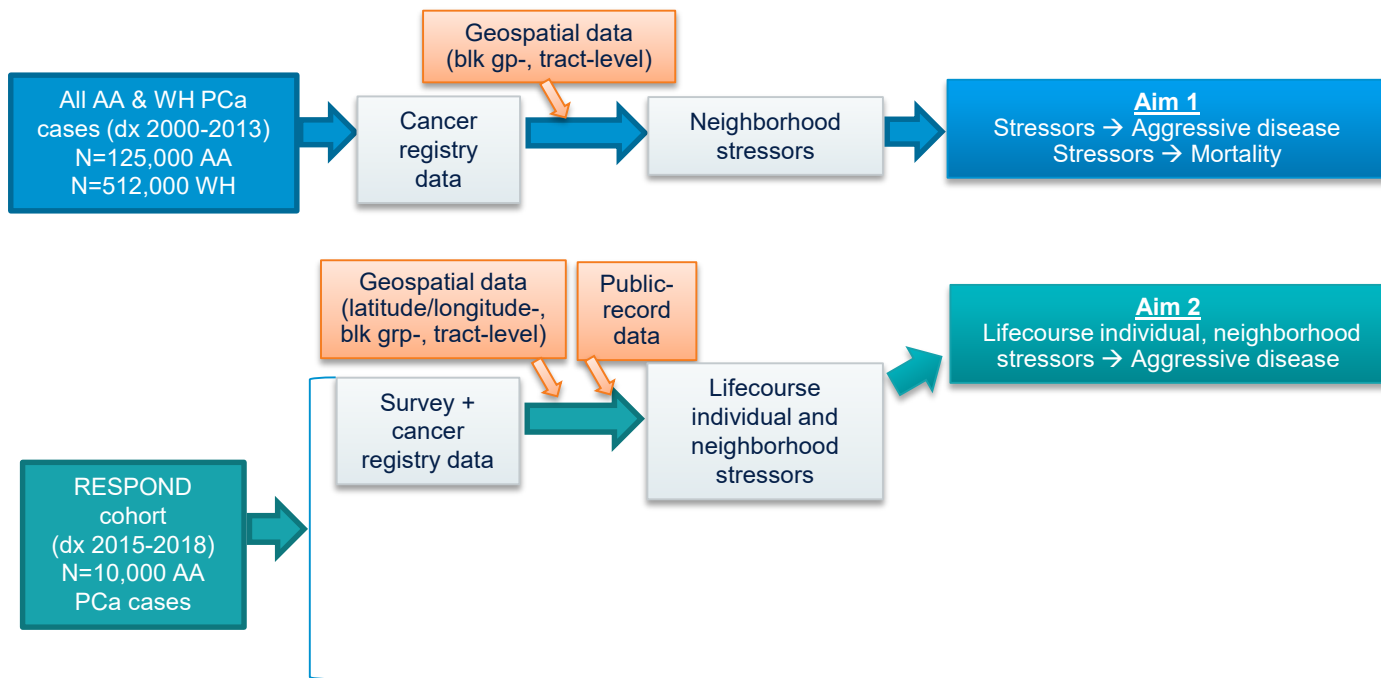




# RESPOND

African American Prostate Cancer Study

## Project 1 Data & Analysis Flowchart

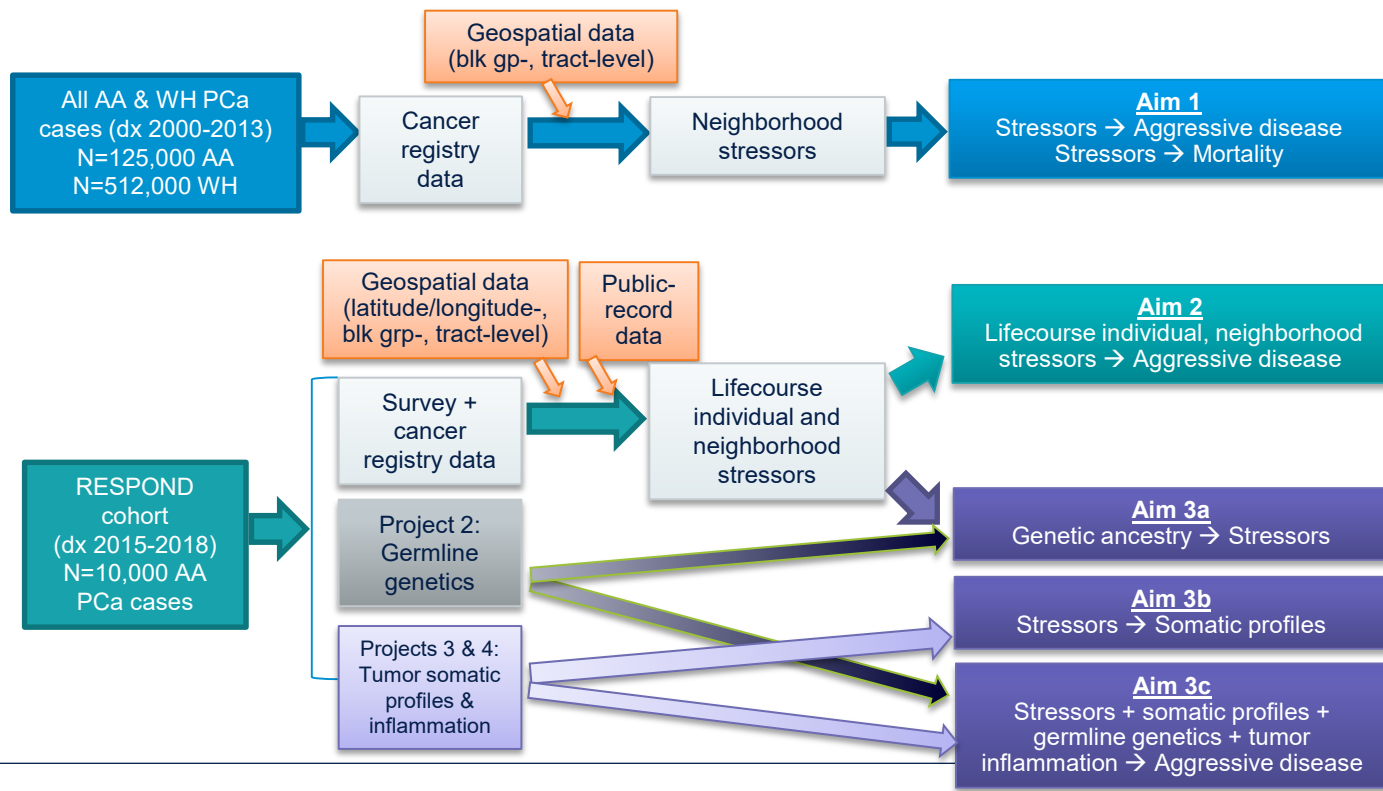




# RESPOND

African American Prostate Cancer Study

## Project 1 Data & Analysis Flowchart



# Individual-level data – social stressors & covariates

Lifecourse multi-level social stressors: neighborhood factors, lifetime and everyday discrimination, medical mistrust, adverse childhood experiences, “John Henryism” active coping

Sociodemographic background: multiple racial/ethnic groups, birthplace, education, health insurance, financial security, marital status, sexual identity, income, employment

Family and personal health history

Prostate cancer treatment

Lifestyle

# Contextual data - social stressors

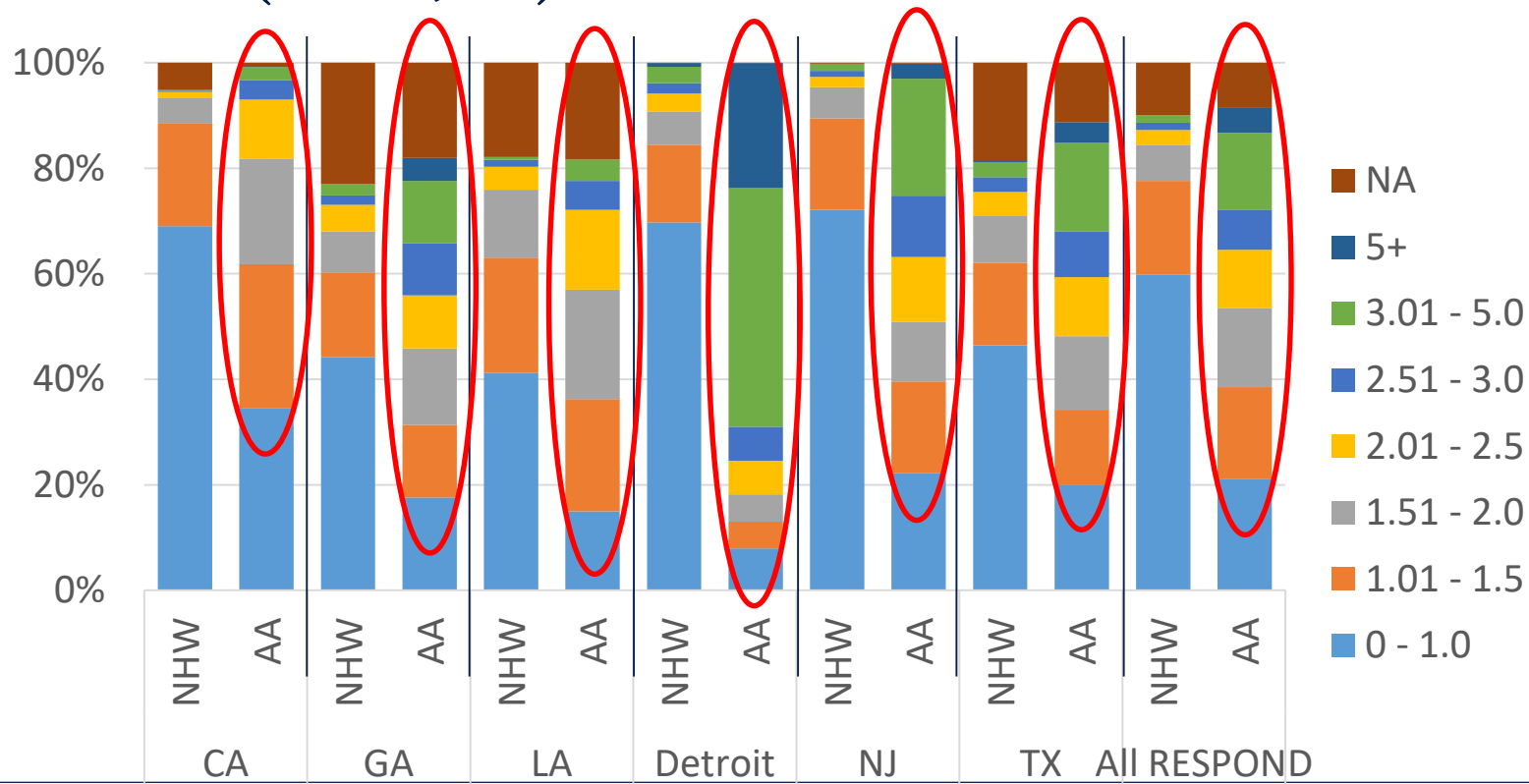
- Structural racism – tract level only for MSAs (K. Beyer\*)
  - Red-lining index
  - Index of racial bias in mortgage lending
- Racial/ethnic segregation
  - City- or MSA-level indices of relative distributions between Blacks and Whites – e.g., dissimilarity index
  - Local segregation measures (J. Gibbons) - typology of various racial/ethnic combinations in census tract
  - Location quotient (LQ) of relative concentration of AAs in a block group compared to the MSA (K. Beyer)
- Racial/ethnic composition
  - % Black in census tract

\*Beyer et al. New Spatially Continuous Indices of Redlining and Racial Bias in Mortgage Lending: Links to Survival After Breast Cancer Diagnosis and Implications for Health Disparities Research. Health Place 2016

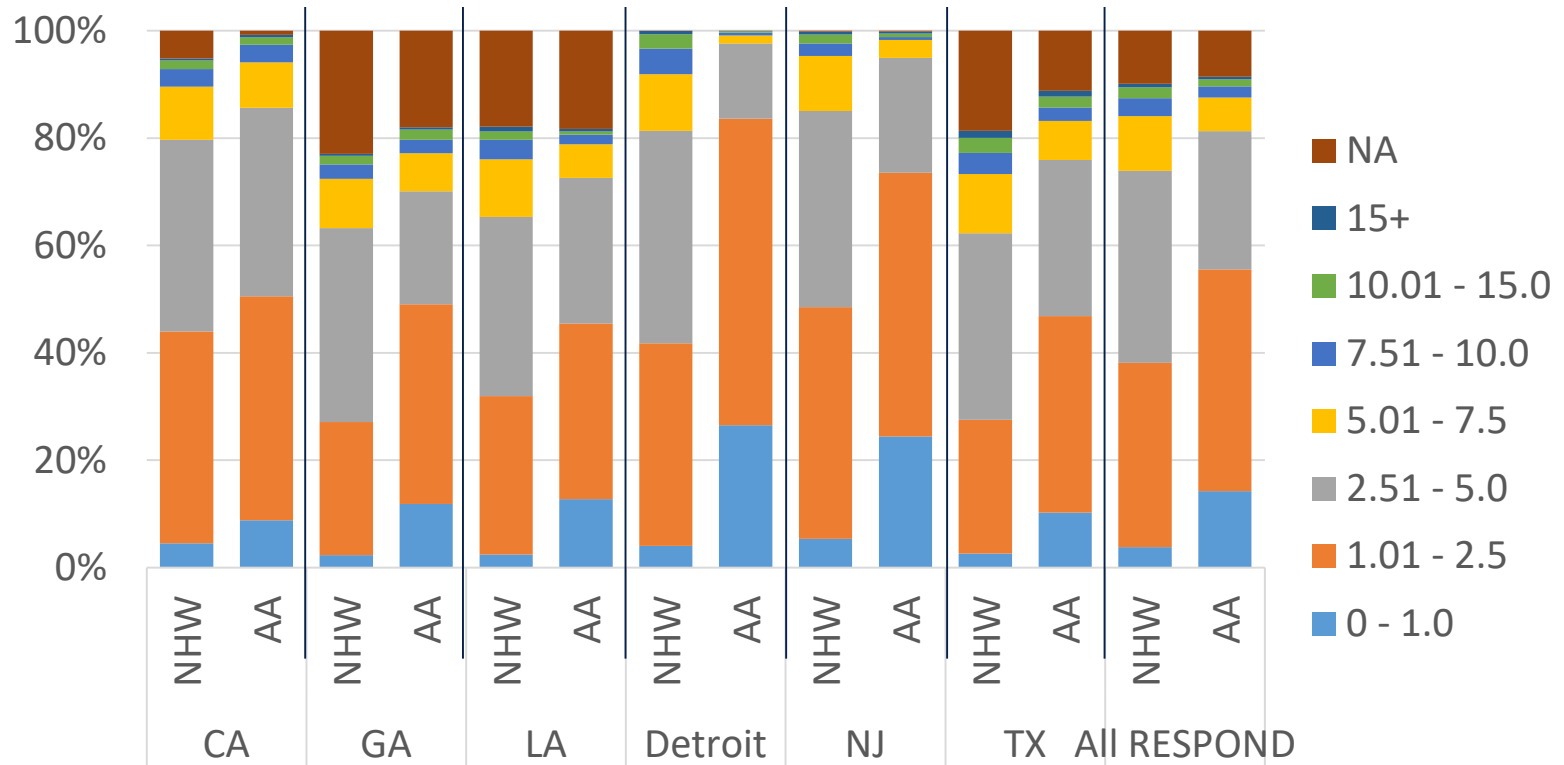
# Contextual data – social & built environment measures

- Neighborhood SES (Yost/Yang index of 7 SES components)
- Urbanicity
- Crime
- Street connectivity
- Total businesses
- Food environment
- Recreational outlets
- Population density
- Housing
- Commute
- Traffic density

# Redlining across RESPOND regions for NHW (n=511,986) and AA (n=124,744)



# Racial bias in mortgage lending across RESPOND regions for NHW (n=511,986) and AA (n=124,744)



# Addressing SDOH in cancer disparities research: challenges & opportunities

Health inequities arise from structural social determinants

- Study structural & institutional factors

- Collect address data & integrate neighborhood context

- Lifecourse, cumulative effects, weathering

- Apply critical race theory

Data needs

- Collect SDOH, Standardized measures

- Granular data

- Training for healthcare professionals, toolkits

Small populations

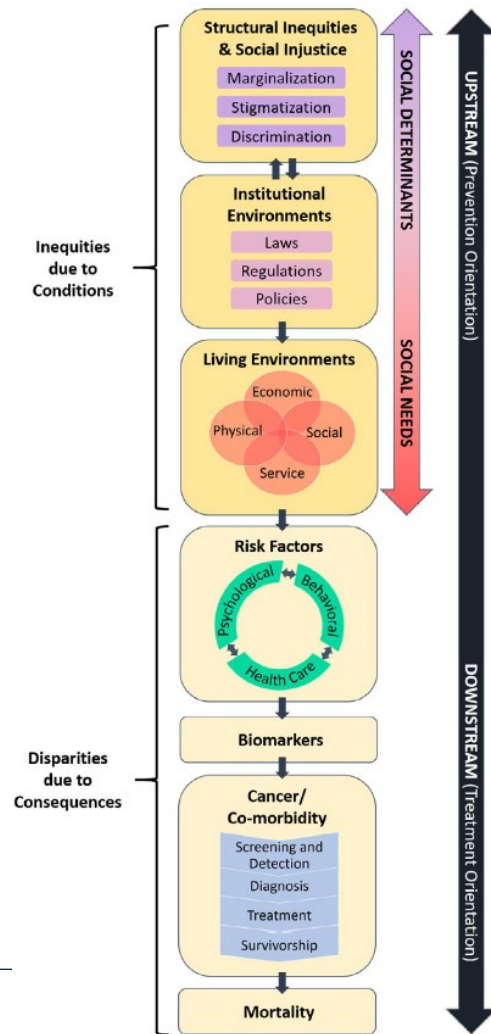
- Consortia comprising multilevel data

- Integrative data analysis

Intersectionality

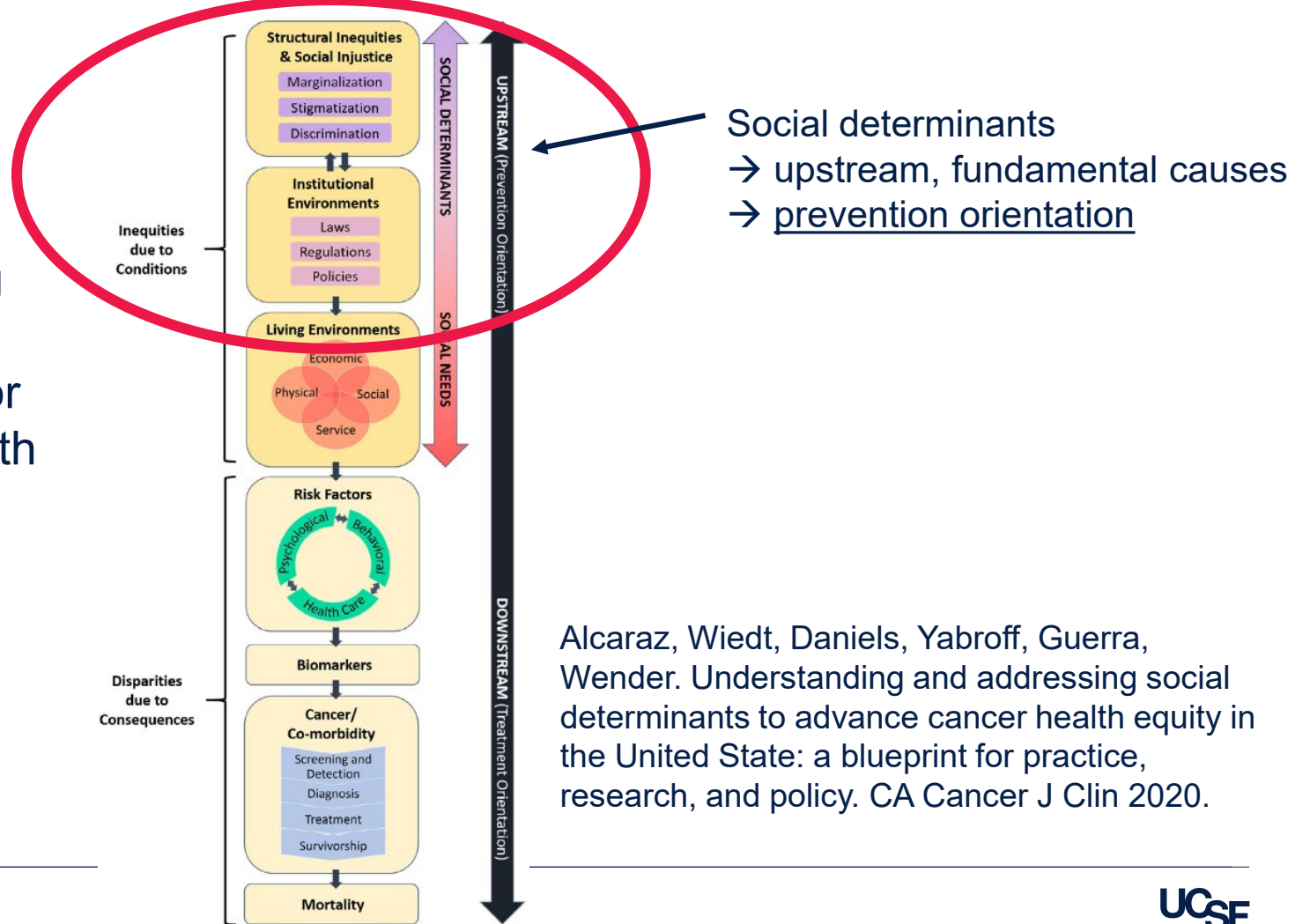
- Interactions among multiple marginalized SDOH statuses

# Integrated conceptual framework for understanding and addressing social determinants for advancing health equity



Alcaraz, Wiedt, Daniels, Yabroff, Guerra, Wender. Understanding and addressing social determinants to advance cancer health equity in the United State: a blueprint for practice, research, and policy. CA Cancer J Clin 2020.

# Integrated conceptual framework for understanding and addressing social determinants for advancing health equity





Without a vision of health equity and the commitment to tackle structural racism, health inequities will persist, thwarting efforts to eliminate disparities and improve the health of all groups... The challenge is great, but rising to this challenge lies at the heart of our mission and our commitment, as health professionals, to prevent avoidable suffering, care for those who are unwell, and create conditions in which all can truly thrive.”

*Zinzi D Bailey, Nancy Krieger, Madina Agénor, Jasmine Graves, Natalia Linos, Mary T Bassett*

**Structural racism and health inequities in the USA: evidence and interventions. The Lancet 2017**




**DREA.III.LAB**

Disparities Research: Environment And oMics



**UCSF**

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