PROXIMITY TO ENVIRONMENTAL HAZARDS: ENVIRONMENTAL JUSTICE AND ADVERSE HEALTH OUTCOMES: DISCUSSION

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OBJECTIVES

- Comment on appropriateness of proximity and exposure to envl hazards to be considered in envl analysis and decision / policy making.

- Should other factors be considered in envl justice decision / policy making besides the 7?

OBJECTIVES

- (Provide framework for concepts)
- Potential future applications or directions
- Issues

APPROPRIATENESS AND OTHER FACTORS

- Appropriate to consider proximity in decision-making and policy? Yes
  - What people are concerned about
  - Often best we can do without in-depth exposure assessment or biomarkers of exposure
- May be challenging to implement

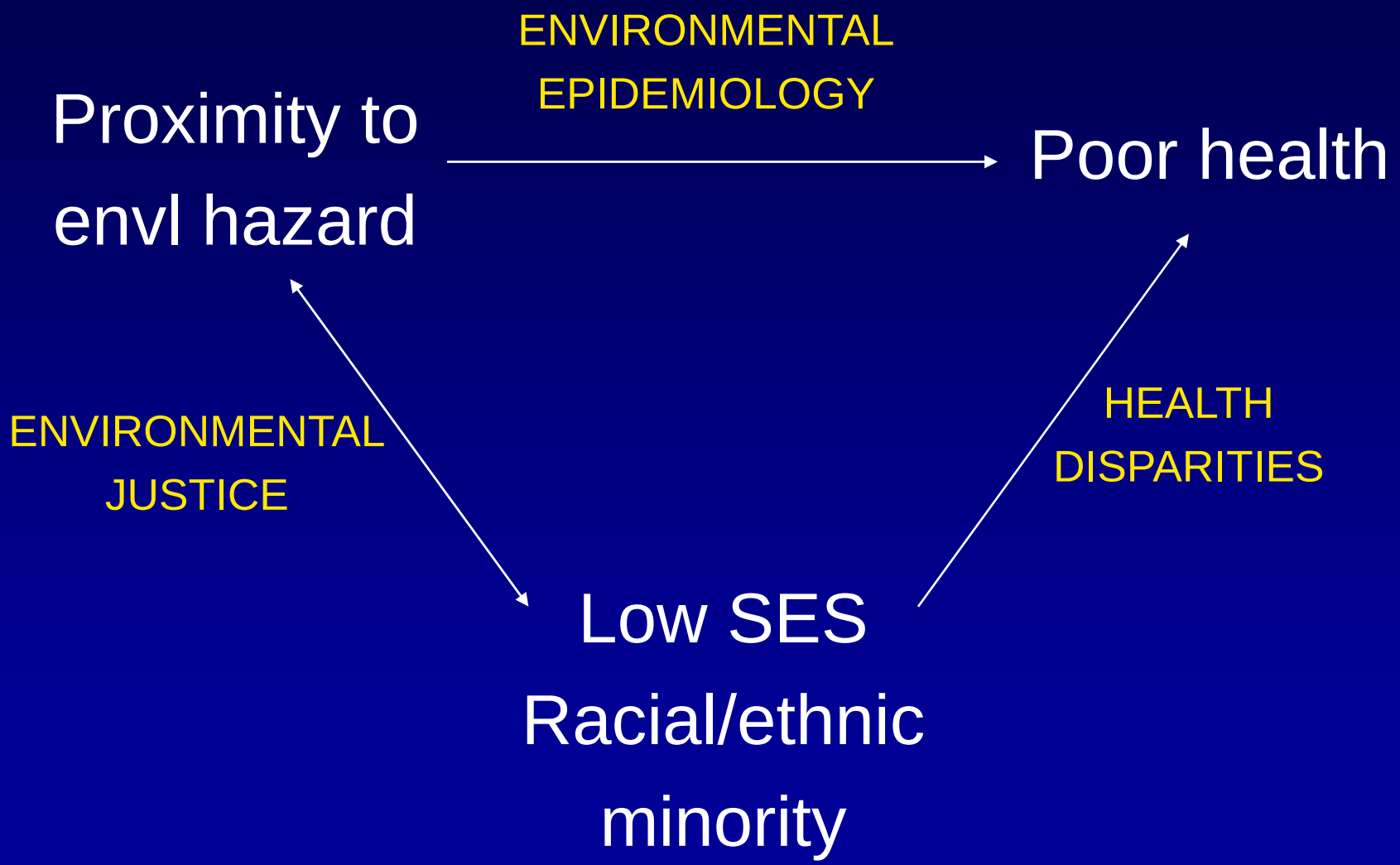
- Other factors?
  - Possibly not at present; the 7 good start

CONCEPTUAL FRAMEWORK

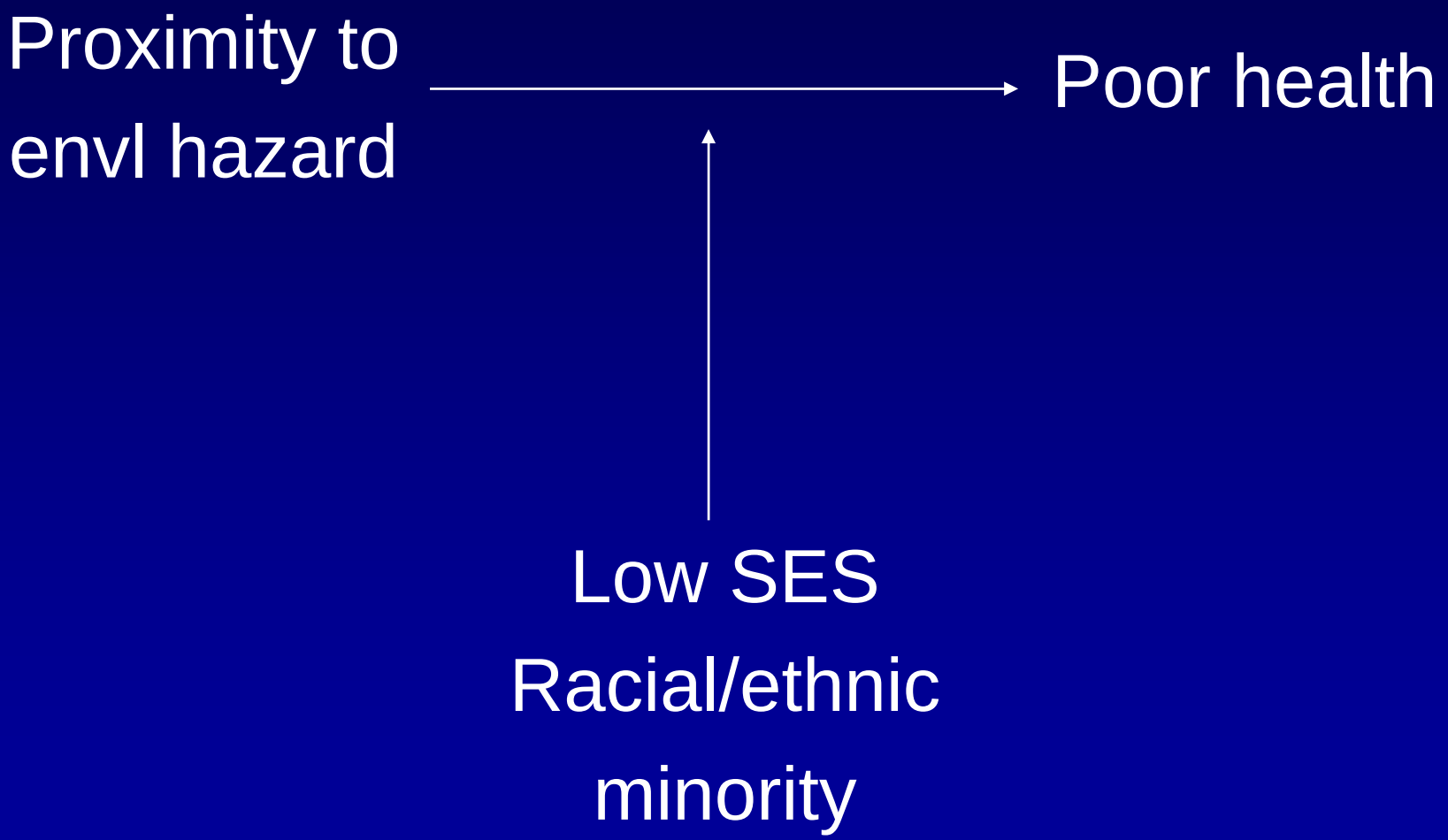
Proximity to envl hazard

ENVIRONMENTAL EPIDEMIOLOGY

Poor health


ENVIRONMENTAL
EPIDEMIOLOGY
Proximity to
envl hazard
Poor health
ENVIRONMENTAL
JUSTICE
HEALTH
DISPARITIES
Low SES
Racial/ethnic
minority

Effect Modification



POTENTIAL ISSUES, APPLICATIONS, AND IMPLICATIONS

My goal: Stimulate discussion

EXPOSURE ASSESSMENT: PROXIMITY AS PROXY

- MAIN LIMITATION: Using proximity to substitute for actual amount of exposure
- Disadvantages:
  - May not be accurate
  - Hard to interpret
  - Conditions differ between studies, areas
- Advantages:
  - What people think about
  - May be useful screen for further in-depth studies

EXPOSURE ASSESSMENT: METHODS TO DEFINE PROXIMITY

- STATED CONCLUSION: Generally:

Spatial coincidence analysis	<	distance-based analysis	<	pollution plume modeling

- COMMENT: All have advantages and disadvantages
- Distance-based advantages may include…
  - What people think about?
  - Still air and resulting peak exposures?

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EXPOSURE ASSESSMENT: DAYTIME ADDRESSES

- STATED RECOMMENDATION: To better understand environmental impact, need to also consider where people are in daytime, not just residential address.

EXPOSURE ASSESSMENT: DAYTIME ADDRESSES

- POTENTIAL ACTION: Encourage studies that combine info from home/work/school addresses
  - Data: Interview studies, time-based weighting?
  - Advantage: Combine with occupational exp?

- POTENTIAL ACTION: Encourage studies that look at people staying at one address
  - Data: Homemakers? Elderly? Incarcerated?

EXPOSURE ASSESSMENT: IMPACT OF MOBILITY

- STATED RECOMMENDATION: Basing exp assessment on single residence address can lead to:
  - misclassification of exposure (often producing lower measures of association with disease)
  - temporal sequence issues (may impact interpretation)

EXPOSURE ASSESSMENT: IMPACT OF MOBILITY

- POTENTIAL ACTIONS:
  - More studies on impact of mobility (may vary)
  - Journal reviewers: impose higher standards
  - Encourage studies where can obtain relevant residence history
    - surveys?
    - credit reports?
  - Encourage studies on addresses in relevant time frame for exposure/outcome latency period

EXPOSURE ASSESSMENT: IMPACT OF MOBILITY

- POTENTIAL ACTIONS:
  - Encourage studies on outcomes with short latency periods (e.g. where probability of moving < 50% before disease diagnosed)
  - Discourage studies on populations with high mobility unless can follow them (e.g. migrant farmworkers)
    - PROBLEM: EJ: poorer folks more likely to move?

EXPOSURE ASSESSMENT: IMPACT OF MOBILITY

Residential Mobility During Pregnancy

- Percent of mothers changing residence between conception and delivery:
  - Cases: 33% Controls: 31%
- Case mothers more likely to move if:
  - Younger
  - Lower household income
  - Non-Hispanic
  - Lower parity
- Control mothers more likely to move if:
  - Younger

Canfield et al. Residential mobility patterns and exposure misclassification in epi studies of birth defects. J Exposure Sci & Environmental Epi (2006)

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EXPOSURE ASSESSMENT: IMPACT OF MOBILITY

Residential Mobility and Exposure

- Median distance moved (ns):
  - NTD cases: 3.5 mi Controls: 3.7 mi
- Benzene exposure from ASPEN (gives CT level estimates):
  - No sig difference in benzene exposure (yes/no) or benzene quartiles based on address at conception vs delivery

Lupo PJ et al. Differences in exposure assignment between conception and delivery: the impact of maternal mobility. Paediatric and Perinatal Epidemiology (in press)

STATISTICAL APPROACHES

- STATED PROBLEM: Most studies use conventional statistics (e.g. regression) that assume:
  - Independent observations
  - Generating process that is homogeneous

- POTENTIAL ACTION: Encourage more studies that use geostatistical approaches

CUMULATIVE, SYNERGISTIC IMPACTS

- STATED RECOMMENDATION: Look at cumulative and synergistic impacts

CUMULATIVE, SYNERGISTIC IMPACTS

- POTENTIAL ACTIONS:
  - Look at exposure to same substance from multiple sources (residence proximity & air, residence location & water, diet, occupational)
  - Look at exposure to multiple substances shown to interact in tox literature
  - Encourage exposure biomarker studies

GENERAL RESEARCH GAPS

- STATED RECOMMENDATION: Research gaps, paucity of envl impacts investigated

GENERAL RESEARCH GAPS

- POTENTIAL ACTION: More hypothesis-generating studies for screening?
  - Borrow techniques from GWAS, Bayesian approaches, data mining
  - Relate more exposure databases with more/broader outcome databases
- POTENTIAL ACTION: Encourage more gene x environment interaction studies?
  - Envl justice may also be effect modification

PUBLIC HEALTH PRACTICE

- STATED CONCLUSION: Few studies have examined whether exposure/proximity is more/less likely to increase risk for adverse health among minority and lower-income populations.

PUBLIC HEALTH PRACTICE

- POTENTIAL ACTION: When determining association btw proximity to envl hazard X and health outcome Y:
  - Don’t just adjust for SES or race/ethnicity
  - Examine stratum-specific associations
  - Can check for effect modification
  - Consider largest attributable risk? (combines magnitude of association and prevalence of exposure)

PUBLIC HEALTH PRACTICE

- ISSUE: Might be unrealistic to expect similar findings across proximity studies
  - May vary in climatic conditions, topography, contaminants
  - Thus proximity effect varies between studies (heterogeneous)
- POTENTIAL ACTION: States, localities do proximity studies in own jurisdictions?
  - May lack resources
  - May lack statistical power

PUBLIC HEALTH PRACTICE

- ISSUE: How should EPA / other agencies consider environmental justice and proximity to hazards in decision-making?

- POTENTIAL ACTIONS:
  - Discount proximity-based studies?
  - Base on most susceptible population group?
  - Others?

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LOGISTICS

- What's needed to provide useful studies?
  1. Data on exposures
  2. Data on outcomes
  3. (Helpful) Useful/unusual situations re: 1 and 2
  4. People with skills to analyze data
  5. Time to analyze them (usually = $$)
  6. Connecting 1-5

- Main limiting factor: #5

LOGISTICS

- POTENTIAL ACTIONS:
  - Directed funding to address specific questions
  - More, smaller grants e.g. to fund small directed projects, dissertation / thesis / practicum work
  - Connections database / clearinghouse

SOCIAL IMPLICATIONS

- Who was there first?
  - Industry
  - Residents
- What to do about that (if anything)?

Thanks