


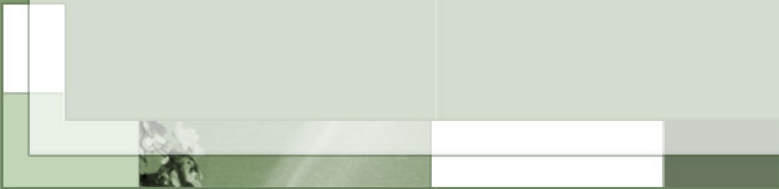


Statistics: a final step for environmental and policy research

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Overview


- Concern for statistical findings related to environments and health (structural confounding)
 - Don't throw the baby out with the bathwater (prospective cohorts)
 - Putting context in context (qualitative research as cross-validation)
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STRUCTURAL CONFOUNDING




SC: introduction

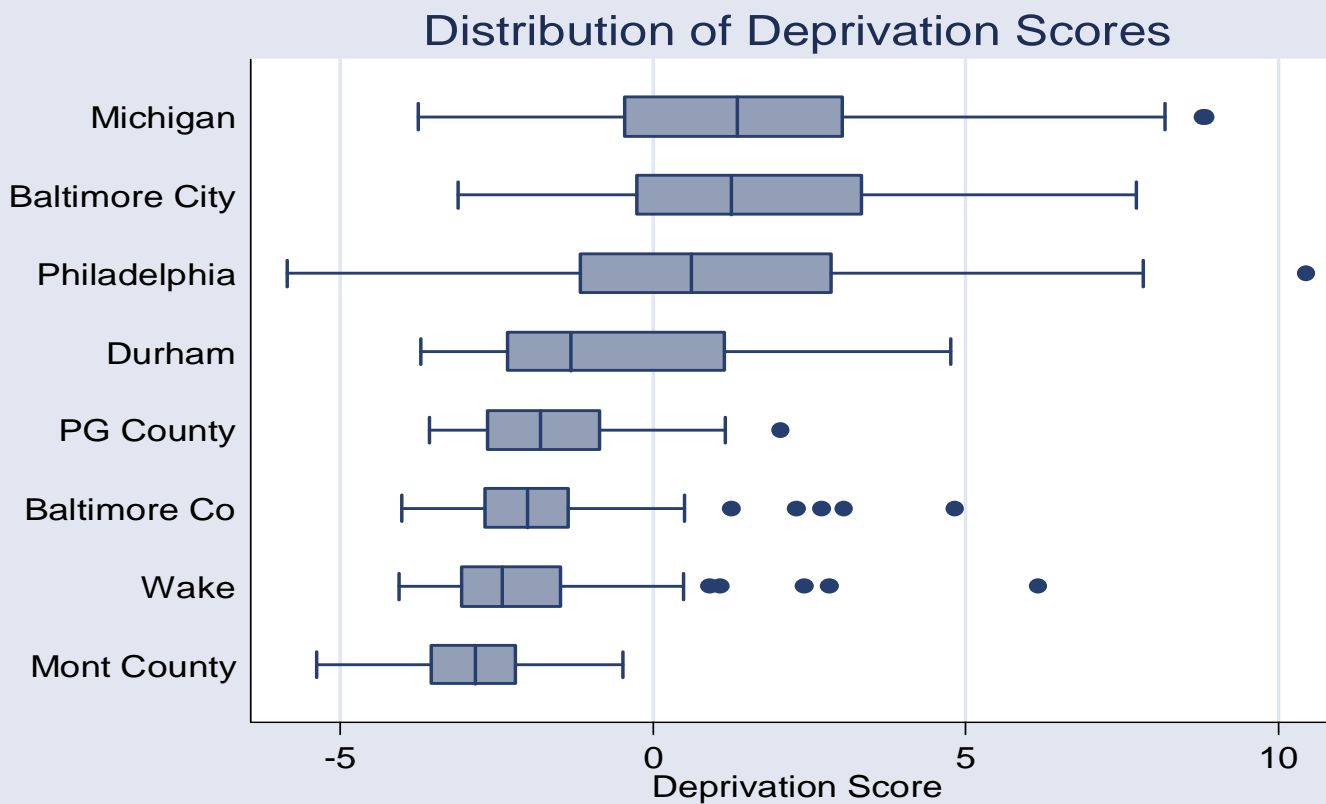
- People differentially locate, we can adjust
 - Better adjustment results in lower likelihood an individual will reside anyplace but where s/he lives
 - Consequence: non-comparable / non-exchangeable persons across contexts; biased comparisons
 - “On support” inferences - based on actual observations; “off support” inferences - result from extrapolation beyond data
 - Motivating question: how far off support are we in typical statistical (multilevel) modeling analyses?
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SC: data sources, measures

- Vital records and year 2000 U.S. census data for Durham and Wake Counties, NC
 - 45,000 + persons; 105 WC, 55 DC tracts
 - Quartiles of neighborhood deprivation index (NDI) used to estimate socioeconomic segregation
 - Quartiles of percent black (%BL) estimated racial residential segregation
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SC: why Wake and Durham County, NC?



SC: results 1

Tract count		NDI 1	NDI 2	NDI 3	NDI 4
Durham County (n=53)	BL% 1	10	2	1	1
	BL% 2	4	6	3	0
	BL% 3	0	5	4	4
	BL% 4	0	0	5	8
Wake County (n=105)	BL% 1	23	4	0	0
	BL% 2	3	12	10	1
	BL% 3	1	8	12	5
	BL% 4	0	2	4	20

SC: results summary

		WHITE NON-HISPANIC				BLACK NON-HISPANIC			
		NDI 1	NDI 2	NDI 3	NDI 4	NDI 1	NDI 2	NDI 3	NDI 4
D U R H A M	%BL 1	Diagonal	Black	Black	Black	Black	Black	Black	Black
	%BL 2	White	Diagonal	Diagonal	Black	Diagonal	Diagonal	Diagonal	Black
	%BL 3	Black	Diagonal	Diagonal	Diagonal	Black	White	White	White
	%BL 4	Black	Black	Black	Black	Black	Black	White	White
W A K E	%BL 1	Diagonal	Diagonal	Black	Black	Black	Black	Black	Black
	%BL 2	White	White	Diagonal	Black	Black	Diagonal	Black	Black
	%BL 3	Black	White	Diagonal	Diagonal	Black	Diagonal	Diagonal	White
	%BL 4	Black	White	Diagonal	Black	Black	Diagonal	Diagonal	White

Black shading- insufficient observations per cell; diagonals- adjustment for one individual-level covariate

SC: model results


(Q1 = referent)

Odds Ratios (95% CI) for PTB	DURHAM COUNTY		WAKE COUNTY	
	White	Black	White	Black
NDI 2	0.8 (0.6, 1.2)	0.9 (0.6, 1.5)	1.1 (0.8, 1.3)	1.6 (0.9, 2.7)
NDI 3	0.9 (0.6, 1.4)	1.1 (0.7, 1.7)	1.1 (0.8, 1.4)	1.4 (0.8, 2.5)
NDI 4	0.7 (0.4, 1.2)	1.0 (0.6, 1.7)	1.4 (1.0, 1.9)	1.5 (0.8, 2.6)
BL% 2	1.1 (0.8, 1.6)	0.8 (0.5, 1.3)	1.0 (0.8, 1.3)	1.2 (0.6, 2.2)
BL% 3	1.2 (0.8, 1.9)	1.1 (0.6, 1.9)	1.0 (0.8, 1.3)	1.1 (0.6, 2.1)
BL% 4	1.6 (0.9, 3.0)	1.1 (0.6, 2.0)	1.1 (0.8, 1.3)	1.3 (0.7, 2.5)

Stratified random effects multilevel logistic models; % black and NDI modeled; one categorical covariate




SC: solutions?

- Possible solutions:
 - Explore, then admit you have a problem
 - Triangulation with other research
 - Data collection targeted to the sparsely-populated cells
 - Probably not solutions:
 - Propensity score analysis (will make SC explicit, but not fix)
 - More data collection within same social structure
 - Sophisticated statistical modeling
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SC: implications


- Statistical models are designed to extrapolate, smooth over sparse data
 - Precision measures suggest data sparseness, but models will run, if possible
 - Physical activity / diet policy recommendations should probably be made for those estimates supported by actual observations
 - Infer with prudence and humility
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PROSPECTIVE COHORT STUDIES



Don't throw the baby out w/the bathwater


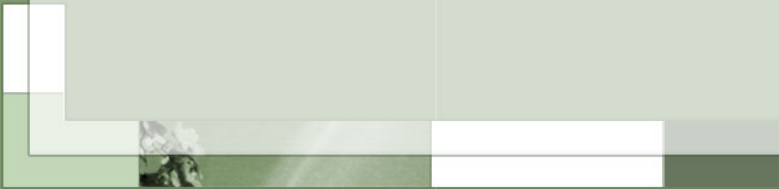
- Prospective cohort studies:
 - Strengths
 - Assessment of trajectories, change, neighborhood treatments
 - Appropriate modeling of time-varying covariates
 - Limitations
 - Ubiquitous exposures
 - Creeping outcomes
 - Don't account for cumulative exposures
 - Often structurally confounded
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CROSS-VALIDATION STUDIES WITH QUALITATIVE RESEARCH



Concerns with qualitative data integrity

- Individual perceptions subject to variety of biases, results of which can be unpredictable
 - same source bias
 - hindsight, fundamental attribution error, confirmation bias, self serving biases
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Anchoring - the tendency to rely too heavily, or "anchor," on one trait or piece of information when making decisions.

Bandwagon effect - the tendency to do (or believe) things because many other people do (or believe) the same.

Belief bias - the tendency to base assessments on personal beliefs

Bias blind spot - the tendency not to compensate for one's own cognitive biases.

Choice supportive bias - the tendency to remember one's choices as better than they actually were.

Confirmation bias - the tendency to search for or interpret information in a way that confirms one's preconceptions.

Congruence bias - the tendency to test hypotheses exclusively through direct testing

Contrast effect - the enhancement or diminishment of a weight or other measurement when compared with recently observed contrasting object.

Disconfirmation bias - the tendency for people to extend critical scrutiny to information which contradicts their prior beliefs and accept uncritically information that is congruent with their prior beliefs.

Endowment bias - the tendency for people to value something more as soon as they own it.

Hyperbolic discounting - the tendency for people to have a stronger preference for more immediate payoffs relative to later payoffs, the closer to the present both payoffs are.

Illusion of control - the tendency for human beings to believe they can control or at least influence outcomes which they clearly cannot.

Impact bias - the tendency for people to overestimate the length or the intensity of the impact of future feeling states.

Information bias - the tendency to seek information even when it cannot affect action

Just-world phenomenon - the tendency for people to believe the world is "just" and so therefore people "get what they deserve."

Loss aversion - the tendency for people to strongly prefer avoiding losses than acquiring gains (see also Sunk costs effects)

Mere exposure effect - the tendency to express undue liking for things merely because they are familiar with them.

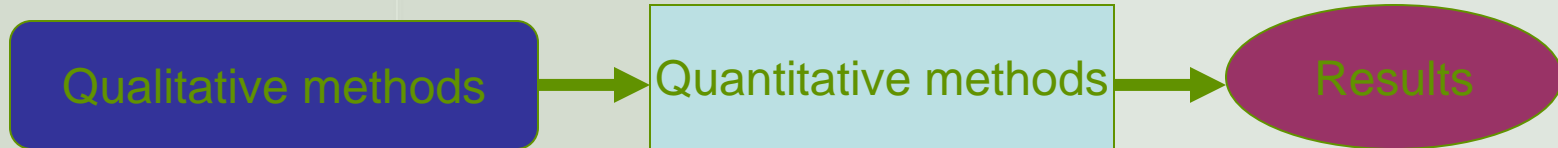
Color psychology - the tendency for cultural symbolism of certain colors to affect affective reasoning.

Planning fallacy - the tendency to underestimate task-completion times.

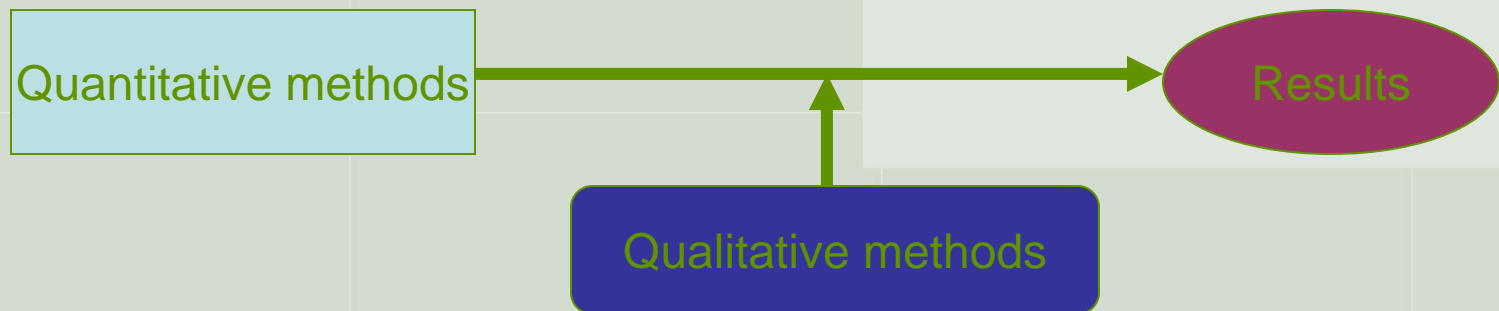
Pseudocertainty effect - the tendency to make risk-averse choices if the expected outcome is positive, but risk-seeking choices to avoid negative outcomes.

Qualitative and quantitative approaches

- model 1: qualitative methods inform quantitative measures and instruments

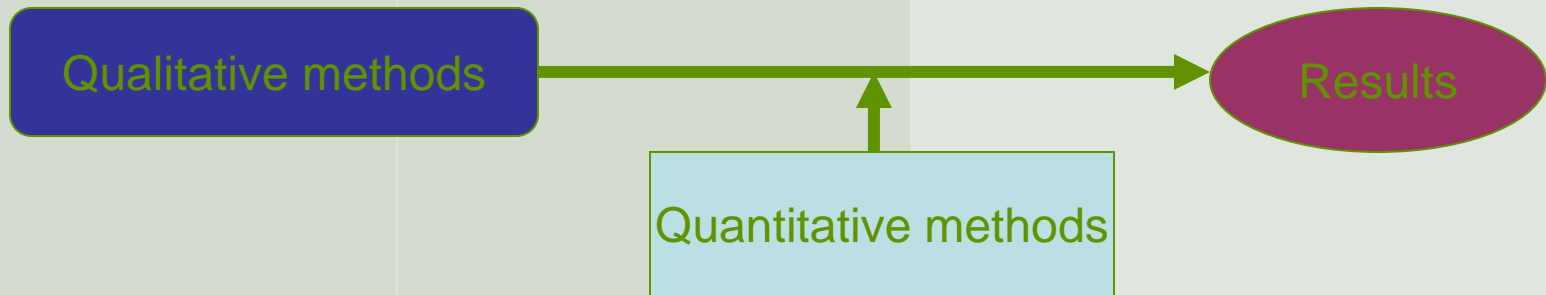


- model 2: qualitative methods explain quantitative findings



Qualitative and quantitative approaches

- model 3: quantitative methods are used to embellish a primarily qualitative study




- model 4: qualitative and quantitative methods are used equally and in parallel





Heat wave - qualitative complement to an epidemiologic study

- CDC study unable to identify risks associated with living in impoverished, politically neglected, resource depleted communities
 - Popular explanations for the different mortality experiences of the matched communities:
 - physiological differences among racial groups
 - extended family support for Latinos in South Lawndale
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Qualitative explanation of quantitative research

- Place-specific social ecologies and effects on cultural practices explained mortality disparity between the two communities
 - North lawndale -
 - abandoned buildings, open space, commercial depletion, violent crime, degraded infrastructure, low population density
 - social isolation, low public life, no local support systems
 - South lawndale -
 - commercial activity, residential concentration, busy streets
 - social contact, collective life, public engagement
 - These factors especially important to vulnerable older populations
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Qualitative explanation of quantitative research

"The principal contribution of this approach is that it deepens our understanding of the reasons that different community areas and different groups had different experiences during the heat wave"


Klinenberg, 2002

The same approach can, and should, be applied to work on physical and diet environments





Summary

- Structural confounding results in the dearth / absence of representative populations in specific social spaces; statistical analyses obscure this physical reality
 - Longitudinal cohort studies wont rescue environmental research from complex conceptual issues, but are still valuable
 - Qualitative inquiry can complement quantitative research in meaningful and informative ways
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