Minority Health Research:
Application of Epidemiologic Methods

Elena S. H. Yu, Ph.D.
San Diego State University
Learning Objective

• To increase awareness on the relevance of epidemiologic methods for studying minority health problems
  – Classic studies
  – prototypical epidemiologic designs
  – Sampling issues
  – Data Analytic issues
  – Inferential errors?
The Framingham Study

- Lowering cholesterol
- Controlling hypertension
- Increasing physical activity
- Avoiding cigarette smoking, etc.
- Methodologic contributions
Important Questions

• Is there any reason to believe that we need to frame the research question differently in terms of the factors that significantly impact the health conditions of a large proportion of minority population?

• What can epidemiology inform us about research on minority populations in this millennium?
Some Flashbacks… In the 1950s

- One-third of New York City’s Midtown Manhattan’s residents were immigrants
  - Germans - 21.7%
  - Irish - 16.9%
  - Czekoslovakian - 9.2%
  - Hungarians - 8%
  - Italians - 7%
  - British - 6.9%
Puerto Ricans and Others

- 4% of Midtown Manhattan’s population was in the age range of 20-59 years
- The group labeled “All others”
  - made up 25% of midtown’s population
  - Predominantly Russians, Polish, and Lithuanians
  - Though different, they were “meltable”
Some observations?

The group most distinctly different from others appear to have the largest percentage of impairments.
Traditional Approaches

- Efforts to improve access to health care
  - Often overlooks urban social conditions
    - Availability of guns, drugs, liquor, fast foods
- Call for change in social conditions
  - Implicitly ignores currently afflicted individuals
- Focus on individual risk factors
  - Blames the individual; negates social dilemma
Minority Health Research: Issues

A. Choice of Study Design
B. Race/Ethnicity Identifier
C. Confounding and Effect Modification
D. Contextualized Analysis
E. Participatory community research
Study Designs

- Sample Surveys
- Cohort Studies
- Clinical Trials
- Case-Control Method
- Hybrid designs
Study Design: Surveys

• Advantages:
  – Obtain estimates of prevalence
  – Explore multiple factors associated with multiple health outcomes

• Disadvantages:
  – High cost; large manpower demand
  – Temporality not established with certitude
  – Takes time to plan, collect, and analyze data
## Hypothetical Sample Survey

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29 45,971  N=46,000

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N=46,000
Problems in Minority Research

- Small numbers overall
- Geographic dispersion
- Confounding of ethnicity by geography
  - Sample unrepresentative of other locations
- Absence of targeted research funding
- Demand for different linguistic versions
- High cost (money, time, manpower)
Study Design: Cohort Studies

• Advantages:
  – Examine multiple outcomes associated with one or a few exposures
  – Temporality more clearly established
  – study natural history of disease
  – assess effectiveness of intervention
  – opportunity for a quasi-experiment
Cohort Studies

• Disadvantages:
  – High cost: population scattered and mobile
  – Sample attrition can be problematic
  – Multiple-language versions
  – Reliability and validity issues
  – Measurement drifts over time
  – A cadre of trained personnel; staff turnover
  – Long waiting period to obtain findings
Study Design: Clinical Trials

- **Equipoise**: a state of genuine uncertainty
  - beneficial effects suggested in literature
  - equally strong evidence of harmful effects
- If standard of care exists, unethical to use placebo group for comparison
- If no or low statistical power, unethical to do the study
Some Issues

• Is it time to translate findings from DASH for use in different minority populations by substituting different ethnic foods?
  – Should we do more trials on minorities? Or,
  – Should we do health promotion right away?

• HRT: the number of minority women not sufficiently large to test for dosage and ethnic differences in response to treatment?
The Case-Control Method

- 1920: Broders
- 1950: Wynder and Graham
- 1950: Doll and Peto
## Recall the Survey Data

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29 45,971

OR = 4.8

C.I.: 1.8, 12.6

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Hypothetical Case-Control Study

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OR = 4.99
C.I.: 1.8, 14.4

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**Key Difference**

**Sample Survey**
- Interview 45,971 non-diseased persons
- Odds ratio = 4.8
- Confidence Interval (1.83, 12.59)
- Need a defined denominator

**Case-Control Method**
- Interview 100 controls (representative)
- Odds ratio = 4.99
- Confidence Interval (1.77, 14.14)
- Useful if no defined denominator
Why Case-Control Method?

- **Advantages:**
  - Numerous factors associated with an outcome
  - Efficiency: quick; low cost; less manpower
  - Feasible to use for program evaluation

- **Disadvantages:**
  - Controls may be unrepresentative
  - Temporality not always determinable if prevalent cases are used
Application to Minority Research

• State of readiness
  – Cases already at ethnic clinics/service agencies
  – Culturally competent manpower on site to assist

• Choice of methods in selection of controls:
  – Incidence density sampling of controls
  – Random digit dialing, and other methods

• Can use different types of controls
  – by ethnicity, disease, geography, etc.
Minority Health Research

A. Choice of Study Design
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D. Contextualized Analysis
E. Participatory community research
Ethnicity Identifier

• Multi-dimensional: pigmentation, values
• Not mutually exclusive: overlapping identities
• May be time- and context-dependent
• Minimum data collected should include:
  – country of birth
  – generation
  – Where educated and native tongue
Ethnicity is a Marker

- Country of birth - one’s own & parents’
- Age on arrival in the U.S., if foreign-born
- Left by choice or by force of circumstance?
- Amount of preparedness for U.S.
- Ability to read English prior to arrival
- Place lived longest (rural, urban, pop. size)
- Prior education and occupation
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1. Z associated with X;
2. Z associated with Y; and
3. Z not an intermediate step between X and Y
Crude vs. Adjusted Estimate

- **Crude estimate:**
  - Association between X and Y, Z absent
- **Adjusted estimate:**
  - Association of X and Y in the presence of Z
- **If no difference between crude & adjusted,**
  - conclude that Z is *not* a confounder
  - Z is irrelevant
If Z is in Causal Pathway

X \rightarrow Z \rightarrow Y

Adjusting Z would be an “overfit”
SES in the Causal Pathway

Race → SES → Health Outcomes

Adjusting for SES would attenuate or eliminate the association between race and health.
Policy Consequence of analysis

- Deny racism is a fundamental cause
  - Called “Fundamental” cause because the health effects … cannot be eliminated by addressing the mechanism that appear to link them to disease (Link and Phelan, 1995)

- Identify SES as the appropriate point of intervention
Failure to understand

has led some epidemiologists to make inferences about genetic transmission ...
Modeling

\[ Y = \text{race} \]

\[ Y = \text{race} + \text{Factor1} + \ldots + \text{etc.} \]

- If the additional covariates do not produce a statistically significant result, drop them.
A Common Conclusion

• The covariates do not help explain the outcome;
• Race difference is important
  – suggests possible genetic/biologic factors
Kaufman et al., 1997

Four sources of residual confounding:

1. Categorization of the SES variable
2. Measurement error
3. Aggregation
4. Incommensurate indicators

• An excellent paper on race and SES
Residual Confounding

• Holding constant income, education, occupation, etc. is not holding constant !!!
• Holding income constant does not make African and white Americans comparable; they differ in what their money can buy.
• Holding education constant, an Asian American college entrant requires a higher SAT score to get admitted.
Assessing Effect Modification

- Requires large sample size.
- Preferably equal sample size b/w groups.
- Over-sampling of minority groups has not achieved this level of comparability.
- Estimate for minority population has a large standard error. Conclude data unreliable.
- SE affects the test statistic and significance.
Issue in Clinical Research

• Should minority populations be included or not?
1993 NIH Revitalization Act

- Purpose: to ensure that all federally funded clinical research include a *valid analysis* to determine whether the intervention under study affects women or members of minority groups *differently* from other subgroups.
- The word clinical research include clinical trials.
Ethical Concerns For & Against

In support of the Act
• okay because no prior data to support ethnic differences; minorities should be included (social justice)
• Inclusion not expected to show subgroup differences

Not in support
• fear of inflated cost
• Increase harm to minorities through “hard sell”/protracted accrual of subjects
• puts politics ahead of science
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Contextualized Analysis

- Cast individualized risk factors in the context of a macro-social environment.
- Examine the life circumstances that shape a person’s exposures to risk factors.
- Distal causes are important.
- Address fundamental causes of mortality and morbidity.
In some academic settings

- The conduct of minority research has been equated with poor-quality research
- Attempts to develop new approaches in sampling rare elements are sometimes viewed as ‘soft’ or irreproducible
- Lack of comparability of measures for majority and minority populations threatens the validity of inferences
How can we do methodologically rigorous research to improve the health of the minority populations and society at large?
Suggested Approaches

Include a social-ecologic systems perspective

• Include group-level variables along with individual risk-factor variables in modeling

• Incorporate qualitative data with quantitative data in interpretation of results

• Understand disease distribution within and between populations
Society’s characteristic at large

- Can affect health outcomes
- Individuals have a personal income
- Populations have an income distribution
- In states where income differences are greatest, people view their social environment as hostile; less likely to join organizations; more distrustful of others (Kawachi, 1997).
Cultural Sensitivity

• Do racial comparisons with knowledge of intra-group variability.
• Study heterogeneity within ethnic groups
• Interpret SES cautiously: is occupation measuring past, cumulative, or current exposure?
• Watch for time- and context-dependent aspects of SES.
• Distinguish age, period, and cohort effects
• Study network structure
• Measure social ties better than we do now
• Understand types and functions of support
• Evaluate and measure chronic stress better
• Include chronic disease over the life course
Chronic Disease

• In 1990, six major chronic diseases were the underlying cause of 60% of deaths in the U.S.

• These diseases are: ischemic heart disease, cancer, stroke, diabetes, COPD, and cirrhosis of the liver (NCHS, 1991).
Newer data analytic techniques

- Repeated measures
- Multi-state modeling
- Adaptive genetic algorithms
- How to deal with missing data?
- How to handle discrepancies between multiple sources of information?
- How to measure quality of life?
More Precise Ecologic Data

• Distinguish between compositional effects and contextual effects (Szwarcwald et al., 1999)
• Compositional effects arise from “the population composition of types of people whose individual characteristics influence their health.”
Compositional Variables

- Common “census” information:
  - Percent unemployed
  - Percent income below poverty level
  - Percent single head of household with children
Contextual Effects

- Contextual effects emerge from the area in which the individual lives or the social groups to which they belong.
- Is the association between income and mortality due to compositional or contextual effects, or both?
- How best to assess their independent and joint effects?
Area Characteristics

- Number of active neighborhood community groups
- Per capita crime rates; injury, mv crashes
- Number and conditions of stores, bars, etc.
- Extent of social services; recreat’l centers
- Perceptions of community problems
- Overall quality of life in a community
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Community Participation

- Research must be capacity-building
- Partners in defining the research problem; symmetrical relationship
- Training of minority scientists
- Mentoring of minority investigators
- Sharing of results with the community
The Community

- Selects the research problem that has social significance; creative problem solving
- Assures the physical safety of participants
- Prevents socially damaging uses of data
- Assures long-term social benefit to the community
- Establish infrastructures for interventions
Distrust between community and scientists

Community participation is important, but does not in and of itself guarantee against mis-communication or misunderstanding the intent of research

Ultimately, improving the educational level of minorities will be beneficial