Modeling Contextual Neighborhood and Social Network Effects on Human Behavior

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“Given the complex interactions of biological, social, environmental, and developmental factors that underlie drug abuse and addiction, NIDA acknowledges the need to take a "whole systems" approach to treating this disease. .” (NIDA Strategic Plan, 2010)

But the prevailing paradigm is generally NOT geographic in nature: Drug addiction as a chronic brain disease within a biopsychosocial model.
Treating a Biobehavioral Disorder Must Go Beyond Just Fixing the Chemistry

We Need to Treat the Whole Person!

Pharmacological Treatments (Medications)

Behavioral Therapies

Medical Services

Social Services

In Social Context

NIDA
Adolescents and their social networks are constituted by the environment in which they operate:

which in turn influences their social network quality, sense of self, & social practices:

and ultimately their health behaviors.

- Protective
  - Identity
  - Roles
- Risky
  - Healthful Behavior
  - High Risk Behavior
Research on Adolescent Substance Use

Sample:
Survey of 301 adolescent primary care patients at a Philadelphia public health care center.

Primarily African-American youth living in low to mid-income neighborhoods.
Features in the Environment
<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Concentrated Disadvantage</strong></td>
<td></td>
</tr>
<tr>
<td>% High School</td>
<td>% of the total population over age 25 with a high school diploma.</td>
</tr>
<tr>
<td>% Employed</td>
<td>% of the total civilian population over age 16 who are employed.</td>
</tr>
<tr>
<td>% Public Assistance</td>
<td>% of the total population receiving public assistance income.</td>
</tr>
<tr>
<td>% Female Headed</td>
<td>% of households female headed with children under 16.</td>
</tr>
<tr>
<td>% Vacancy</td>
<td>% of housing units vacant.</td>
</tr>
<tr>
<td><strong>Ethnic Diversity</strong></td>
<td></td>
</tr>
<tr>
<td>% Foreign</td>
<td>% of the total population who were born outside the U.S.</td>
</tr>
<tr>
<td>% Linguistic Isolation</td>
<td>% of the households with no one over five years old who speaks English.</td>
</tr>
<tr>
<td>Racial Diversity</td>
<td>Index of racial diversity.</td>
</tr>
<tr>
<td><strong>Hispanic</strong></td>
<td></td>
</tr>
<tr>
<td>% Hispanic</td>
<td>% of the total population that self-identifies as Hispanic.</td>
</tr>
<tr>
<td><strong>Crime</strong></td>
<td></td>
</tr>
<tr>
<td>Violent Crime Rate</td>
<td>Number of violent crimes per capita, 2000-2002.</td>
</tr>
<tr>
<td>Property Crime Rate</td>
<td>Number of property crimes per capita, 2000-2002.</td>
</tr>
<tr>
<td><strong>Residential Mobility</strong></td>
<td></td>
</tr>
<tr>
<td>% Renter</td>
<td>% of the total households that are renter occupied.</td>
</tr>
<tr>
<td>% Same House</td>
<td>% of the population over five years old who live in the same house they occupied 5 years ago</td>
</tr>
</tbody>
</table>
Some Findings

1. Perceptions of safe and risky places differ between substance users and non-users, where non-users are more sensitive to their environment.

2. The contextual characteristics of perceived risky places are particularly influential on substance use.
   a. Perceived risk typically revolves around exposure to unstructured social interaction, as in malls and recreation centers, e.g. “There’s lots of dangerous people around and it’s a wide-open place.”

3. Proximity to bars, concentrated disadvantage, and other theorized negative influences at the perceived risky place enhances substance use.

4. Accessibility to certain pro-social activities that we theorized would suppress substance use (e.g. recreation centers) are actually associated with enhanced substance use.

5. Contextual effects are moderated by age and gender.
Moderation of Contextual Effects by Age

Moderation of Concentrated Disadvantage by Age

Moderation of Social Network Quality by Age

\( \text{Estimated AADIS (z-score)} \)

\( \text{Concentrated Disadvantage (z-score)} \)

\( \text{Social Network Quality (z-score)} \)

16 = age of adolescent

10 = age of adolescent
1. Geographic and social contexts are integral to understanding behavior and designing effective substance abuse prevention and treatment programs.

2. To capture geographic and social contexts, one must focus not only on the home location, but also on the activity space of individuals.

3. Geographic and social contexts are not independent but, rather, intertwined and interrelated forces on behavior.

4. The role of contextual mechanisms on behavior is manifested through the perceptions and interactions of the individual with their social and geographic environments.
Challenges

1. How do we collect data on integrated social networks, activity spaces, and perceptions and interactions of individuals with their geographic and social contexts?

2. How do we develop more sophisticated conceptual and statistical models that will enable us to more fully test for cause and effect, processes of mediation and moderation, and mechanisms of selection versus influence?

3. Since much of these data may be multidimensional and complex, and may take the form of imagery, narrative text, and other non-quantitative formats, how can these data be integrated and analyzed effectively?
Social-spatial Risk and Protective Mechanisms in Urban Adolescent Substance Use (NIDA; PI Mason, Co-PIs Mennis, Light, Rusby, Westling, Crewe)

Figure 2

- Individual Variables:
  - Substance Use (I)
  - Mental Disorders (I)

- Link Variables:
  - Network Risk (J)

- Location Variables:
  - Neighborhood Poverty (F)
  - Alcohol Outlets (F)

RSIENA for dynamic networks (Ripley, Snijders, Preciado, 2012)

Space-time path (Kwan, 2008)

Qualitative-Quantitative Data Explorer

EMA
Do we need a new term?

Geo\text{biopsychosocial}?

Bioge\text{o}psychosocial?

Biopsychoge\text{o}social?
Acknowledgments

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Selected Publications:


