Substance Use, Social Networks, and the Geography of Urban Adolescents

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ABSTRACT

This article demonstrates a research strategy and prevention methodology for substance using urban youth that incorporates individual, social, and geographical parameters to systematically understand the ecology of risk and protection for urban youth. The primary goal of this study was to describe and analyze substance using and nonusing urban adolescents’ social networks; risky and protective settings where they socialize; and the relationship to health outcomes such as substance use, depression, and stress. Geographic Information Systems (GIS) derived spatial relationships and analyses between the specific locations where the teens are active, their

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subjective ratings of these locations, and objective environmental risk
data. These social network and GIS data were merged to form a
detailed description and analysis of the social ecology of urban
adolescent substance use. A case study was constructed to illustrate
the methodology of creating a three-dimensional ecological profile
that helps explain these relationships and provides preventive
applications. Linear distances were computed between the homes
of the users and the risky and safe places that they identified. On
average, the distance between users’ homes and their identified safe
places was three times the distance between their homes and their
identified risky places. This study provides support for under-
standing urban adolescent substance use through the detailed and
multiple dimensional analysis of teens’ social ecologies.

Key Words: Urban adolescents; Substance use; Social network;
Social ecology; Geographic information systems (GIS); Prevention;
Risk processes; Protective processes; Natural helping systems;
Transdisciplinary.

These data begin to illustrate that the ecological settings of
urban adolescents’ lives can inform prevention by recognizing
the significant connections between teen’s co-participants of
their lives (social network members) and the everyday settings
in which their behaviors are expressed (risky, neutral, and
protective locations).

INTRODUCTION

A growing understanding of the utility of transdisciplinary applica-
tions to the dynamic and fluid nature of youth health behavior has
provided an opportunity for researchers to expand their disciplinary-
driven frameworks in order to more fully understand the complexities of
the social ecologies of modern youth. Specifically, a social ecological
approach to adolescent health behavior explores the connections between
teens’ health, co-participants in their lives, and the everyday settings
in which their health behaviors are expressed. The current study is
an example of a research strategy and prevention methodology for
substance-using urban youth that incorporates individual, social, and
geographical parameters in order to systematically understand the
ecology of risk and protection for urban youth.

While efforts for the past quarter of a century have provided insight
into aspects of adolescent substance use trends, treatment, and
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prevention intervention effectiveness (Botvin et al., 2000; CSAT, 2001; Johnston et al., 2001) there is a need for a way to understand in a more detailed and comprehensive fashion the etiology, trajectories, social, and environmental factors of adolescent substance involvement. It is possible that by better understanding the interactions among individual, social, and environmental factors, prevention program effectiveness may be maximized for different groups of youth (Sussman et al., 2001). This type of research has been limited in part by the complex nature of this task and in part by the lack of in-depth methodological approaches that can address the nuances of the social ecology of adolescent substance use.

Several conceptual models have been advanced (Bronfenbrenner, 1979; Leshner, 1996, August) that provided a language to organize the interaction between developing persons and their environment. Recently much has been written about ecological approaches that seek to understand individuals as they are constituted by particular settings and contexts. Bronfenbrenner’s (1979) seminal work on the social ecology of human development provided a model to understand the interaction between the developing person and their environment. He proposed four developmental systems within a complex interactive model of nested environmental structures. The first system is the Microsystem, which is most proximal for the developing child. Elements of this system are ones in which the child participates directly, e.g., family, school, peer group, and neighborhood. The next structure is the Mesosystem, which is the interaction among the Microsystems. These relationships do not include the child directly but are considered to indirectly influence development, e.g., family-neighborhood relations. Research has demonstrated that without strong, close, overlapping connections between these two systems, healthful development is threatened. Likewise, an increase in the number and complexity of healthful relations provides protection and enhances development (Botvin et al., 2000; Bronfenbrenner, 1979; Johnston et al., 2001). The third and fourth systems are the Exosystem, in which the child is not an active participant, e.g., social services, mass media, and the Macrosystem, which represents cultural traits and ideological beliefs, e.g., French culture, political ideology. Bronfenbrenner’s (1979) model illustrates that these varied influences are typically experienced through encounters with a particular system as well as from interactions between systems.

The study of risk and protective factors typically has approached problem behavior in a linear fashion, creating statistical models to identify and predict risk and protective factors for substance use. For example, as many as 72 risk and protective factors have been identified thus far for the development of a substance abuse disorder (Leshner,
The assumption is that once these factors are identified and classified the developmental trajectories of children could be predicted and ultimately manipulated for healthier outcomes. The risk and protective factor model has been organized by domains for children: individual, family, peer, school, and neighborhood. One of the primary limitations of this model is that it only examines the children’s interactions within each domain and neglects the interactive effects among domains (Szapocznik and Pantin, 1996). Additionally, the focus on factors in isolation at the expense of more complicated processes—patterning of relations among seemingly disconnected variables in a child’s social ecology—is likely to overstate the power of a single factor (Szapocznik and Coatsworth, 1999). Hence, these critiques illustrates the problem of utilizing a linear, causal, and decontextualized approach to addressing youth problem behaviors. Without addressing the complex, difficult bounded issues of culture, place, age, time, gender, ethnicity, and class, youth researchers are likely to yield superficial results that are only applicable in the broadest, macro level.

A recent theoretical development that sensitively builds upon Bronfenbrenner’s (1979) work by providing a framework for organizing the influences on substance use is Szapocznik and Coatsworth’s Ecodevelopmental Model (1999). This model examines the child within and across the ecological systems that may be involved in risk and protective processes that influence substance use. This model is predicated on the need for researchers to examine beyond the primary social ecological domain of interest and across to the other social systems that may be involved in posited risk and protective processes (Szapocznik and Coatsworth, 1999).

In particular, for urban adolescents in high-risk environments, many of these environmental risks have greater consequences than nonenvironmental factors (Hartup and Laursen, 1991). For example, opportunities for risky experimentation and lack of opportunities for constructive expression of emerging identities and capacities lead to higher incidents of high-risk behavior and poorer mental health outcomes for urban youth (Nettles and Pleck, 1994). Unfortunately, many urban, low-income neighborhoods provide more opportunities for risky experimentation than for constructive expression. On the other hand, many urban neighborhoods can be understood as a system of numerous and varied expressions of attachments (networks) operating simultaneously within urban contextual settings (Klebanov et al., 1997). Dense, healthful social networks within these neighborhoods can provide opportunities for positive modeling, mentoring, and sponsorship for adolescents (Furstenberg and Hughes, 1997).
Critical variables related to social support, to the seeking for and the use of natural helping systems, and to pathways to service delivery systems are known to be spatially differentiated at the neighborhood level and can be mapped for analysis (Andrews, 1985). Social ecological analysis can be useful where patterns of social networks exhibit systematic spatial variation that might be detected, defined, and mapped to guide prevention efforts.

Relatively little research exists documenting urban adolescents' social networks, detailed effects of neighborhoods and communities, and health promoting vs. compromising behaviors. This type of research would more accurately inform the development of targeted and appropriate interventions (Brooks-Gunn et al., 1997; Burton et al., 1996). This research could include studies to increase understanding of interactive effects of urban teens’ network structure and quality, and the neighborhoods in which these networks are embedded, to more accurately describe the developmental, social, and environmental influences of health behaviors. Consequently, leaders in the adolescent substance use field now are calling for an increase of our understanding of adolescent social development among urban, minority youth in high-risk settings (Griffin et al., 2002).

Geographical Applications

Geographic Information Systems (GIS) is a powerful set of tools that captures, manages, analyzes, and visualizes spatial data (Burrough, 1986; Clarke, 2002). Essentially, GIS is developed to answer the questions, “what is where?” and “why it is there?” In other words, GIS is used to detect and recognize spatial patterns and investigate the processes that shape them. Most data by default have a spatial component, such as the location where data are gathered. However, most social science research has made little use of the spatial component. In contrast, geographers primarily focus upon the spatial component and thus, their research is formulated using space as the core variable. Spatial data can be captured in a GIS by digitizing, a process that transforms paper maps into digital format, allowing users to readily manipulate these data. Large relational geospatial databases can be developed by integrating geographic information with others, such as social, economic, cultural, and environmental information. Because this information can be tied to specific geographical features, such as counties, census tract areas, or even addresses, GIS affords researchers the opportunity to overlay multiple layers of information with a unified geographical referencing system. The GIS
can be viewed as a special kind of information system in which information is related by its shared spatial identity (Star and Estes, 1990).

The subject of topology is concerned with those features of geometry which remain unchanged after twisting, stretching or other deformations of a geometrical space. It is the study of all different sorts of spaces, using qualitative questions about geometrical structures. GIS utilizes explicit topology spatial relationship concepts such as adjacency (e.g., does census tract A share a boundary with census tract B, hence promoting interaction between the two?) and connectivity (e.g., is A street connected to B street, hence allowing continuous flow of movement?), in interpreting the social network the subject establishes in his/her neighborhood.

The term geo-coding or geo-referencing is used to describe a process by which a specific location is given a label identifying its location with respect to some common reference point. Geo-coding is applied by employing GIS that uses the street addresses as well as the Typologically Integrated, Geographically Encoded Reference (TIGER)/Line files provided by the United States Census Bureau. The TIGER files represent the features of the earth as points, lines, or polygons referenced to specific geographic locations by such conventional means as longitude and latitude, and state plane coordinate systems, or x-y coordinates from a specific frame of reference. These files define the geographical entities by which the Bureau of the Census collects data. For example these files assist in describing roads, hydrography, or other linear features of the earth (Library of Congress, 2000).

In this study, GIS was used to first extract the environmental information (in terms of posited protection and risk) of the subject’s residential zip code area. For example, the locations of alcohol outlets, libraries, boys and girls clubs, crime incidences, and parks were geocoded. As this is the first attempt to build a database of resources as well as risk locations, we began by simply listing commonly accepted urban resources (e.g., boys and girls clubs of America as well as alcohol outlets). We plan on building this data base as we interview more teens to gain a greater sense of the relevance of various resources from their perspectives, thereby using GIS in a more contextually sensitive manner. Similarly, GIS allowed derivation of spatial relationships between these locations of posited risk and protection and the geographic areas where the subjects were active (activity space). Data was analyzed to determine the effect of social network affiliation and how the geographical risk characteristics potentiate different outcomes of substance use, depression, and stress. The GIS technology permits characterization of a more comprehensive social ecology in which risky experimentation or constructive expression can be spatially mapped and analyzed.
METHODS AND PARTICIPANTS

Sample

It is often methodologically useful when embarking upon a new intervention to be able to compare a case study with some relevant local group or data as well as with national data. Toward this end, we compared our case study to our small convenience sample in order to make more sense of the case study findings. In 2002 a sample was drawn from the Georgetown University Medical Center, Adolescent Medicine Clinic, which consisted of 37 adolescents aged 14–18, with a mean age of 15.5. The sample was 51% female. The race/ethnicity of this sample was 49% African American, 37% White, 12% other international origin. Participants were from predominantly impoverished areas with high crime rates. Data from schools where the sample was drawn indicated that 84% of students qualified for free lunch programs. The sample was drawn from a high crime risk area (7.5 times the national average), and had a dense concentration of alcohol outlets compared to the rest of D.C. All patients were recruited by a trained research assistant, who had a bachelor’s degree in psychology. The teens and their parents or guardians were told that we were evaluating the social networks of adolescent substance users and nonusers and detailed explanations were provided about social networks, types of questions, and confidentiality. Of those teens who were eligible for the study, only 10% refused to participate. The interview took approximately 45 to 60 min to complete for each teen. All interviews were conducted in private offices adjacent to the adolescent health clinic to help ensure privacy.

Measures

Self-reported substance use or nonuse information was initially gathered from patient charts identified through the Guidelines for Adolescent Preventive Services (GAPS) (Elster and Kuznets, 1994) intake form located in patients’ medical records. The GAPS is a 69-item self-report questionnaire that provides physicians with a checklist of high-risk behaviors such as substance use. The GAPS is a clinical checklist designed to trigger further questioning by health care providers. The GAPS form combined with clinical interviews has been found to increase the accuracy of risk identification in adolescents (Schubiner et al., 1994). Further validation of substance use was conducted through the administration of the Adolescent Drug Involvement Scale (ADIS)
The ADIS is a research scale that has acceptable internal consistency (alpha = .85) and correlates highly (r = .72) with self-reported levels of drug use, with subjects perceptions of the severity of their own drug use problem (r = .79) and with clinical assessments (r = .75). The ADIS creates categories of substance involvement based upon cut-points: Scores of below 30 fall into either the “little to no use” or “experimental use” categories. Scores of 30 to 40 are “serious drug involved” category, scores above 40 are likely to be diagnosable for abuse or dependence according to DSM-IVR.

Depressive symptoms were measured using the Children’s Depression Inventory, (CDI) a 27-item self-report (Kovacs, 1992). This measure obtains diagnostic symptoms that parallel adult depression, through the use of age appropriate items. The CDI requires the lowest reading level of any measure of depression for children and adolescents. The CDI quantifies a range of depressive symptoms including disturbed mood, hedonic capacity, vegetative functions, self-evaluation, and interpersonal behaviors. The CDI has acceptable internal consistency (alpha = .89) and correlates highly (r = .79) with the Piers-Harris Self Concept Scale, with the Depression Self Rating Scale (r = .81) and with the negative composite of the Children’s Attributional Style Questionnaire (r = .63). The CDI generates normed-derived total score, and five scale scores: (a) negative mood; (b) interpersonal problems; (c) ineffectiveness; (d) anhedonia; (e) negative self esteem.

Stress was measured by Adolescent-Family Inventory of Life Events and Changes (A-FILE) (McCubbin et al., 1981). The A-FILE is a 50-item self-report instrument designed to record normative and nonnormative life events and changes an adolescent perceives their family has experienced during the last 12 months, with 27 items assessing events prior to the past year. The A-FILE is internally consistent (alpha = .69). Test-retest reliability is .82 and the validity research indicates that pile-up of family life events (high A-FILE scores) was positively associated with the use of cigarettes and alcohol and negatively associated with the nonuse of cigarettes, alcohol, and/or marijuana (McCubbin et al., 1981).

The geography of risk and protection was measured by the Ecological Interview that produces a geographically specific listing of the teen’s daily activity locations, as well as evaluative descriptions of various geographical environments (Mason et al., 2003). It produces a listing of safe, risky, and important places that the adolescent most often frequents. These locations were defined for the adolescent as safe, (Safest place from harm, danger, or the likelihood of engaging in risky or dangerous activities), risky, (the place where you are most likely to engage in risky or dangerous activities, cause trouble, or do illegal
activities), important, (having the biggest impact on your life, most meaningful). Further, this interview locates social network members into the specific geographical locations identified by the index subject. The Ecological Interview was created for our research project and is a brief, structured interview based on the qualitative methodology known as Free Listing. (Gorman et al., in press; Nichter et al., in press; Weller and Romney, 1998; Valente et al., in press) Theoretically it is based on an Environmental Indicators of Health Outcomes measure (Cheadle et al., 1992).

Social network data was measured using the Adolescent Social Network Assessment (ASNA) created for this study through the approved adaptation of existing social network measures (Hall, 1995; Hirsch, 1979; Rothenberg, 2001). The ASNA is a structured interview that characterizes egocentric social network data on multiple dimensions. This instrument produced social network data in the form of overall network risk or protection (number of substance-using members, pressure to use or not to use, positive and negative activities); density (percentage of members who know each other); multiplexity (percentage of members in two or more domains, e.g., school and neighborhood); proportion of adult members, satisfaction with network, type and frequency of contact; distance between members; types of relationships; and perceived closeness. Positive activity estimates were determined by the number of times a network member has helped with or been involved with the following type of activities in past month: transportation, school/work, sports, club, talk/support, child care, church. Likewise, negative activity estimates were determined by the number of times a network member has been involved with the following type of activities in past month: substance use, illegal activities, violence, risky sexual activity.

RESULTS

Whole Sample Results

Over half of the subjects disclosed the use of substances (65%, n = 24) indicating that the adolescent primary care clinic is a setting where sensitive data can be collected. Substance use data revealed that on average, subject use fell into the serious drug involvement category, meaning their use was more than experimentation but not yet diagnosable as abuse or dependency as measured by the ADIS. Most popular substances used were alcohol and marijuana, followed by
Table 1. Measures, items, data type, skill level, time of administration, and comments.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Items</th>
<th>Data</th>
<th>Skill level</th>
<th>Time</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adolescent drug involvement scale</td>
<td>13</td>
<td>Ratio</td>
<td>Adolescent self report or interviewer read</td>
<td>10min</td>
<td>Brief measure of drug involvement</td>
</tr>
<tr>
<td>Children’s depression inventory</td>
<td>27</td>
<td>Ratio</td>
<td>Children and adolescent self report or interviewer read</td>
<td>10min</td>
<td>Low reading level, well researched</td>
</tr>
<tr>
<td>Adolescent-family inventory of life events</td>
<td>50</td>
<td>Ratio</td>
<td>Adolescent self report or interviewer read</td>
<td>10min</td>
<td>Stress events measured from family-based perspective</td>
</tr>
<tr>
<td>Adolescent social network assessment</td>
<td>22–110*</td>
<td>Categorical, Ordinal, Ratio</td>
<td>Adolescent interviewer read</td>
<td>20min</td>
<td>Simple spreadsheet of network members characteristics</td>
</tr>
<tr>
<td>Ecological interview</td>
<td>8</td>
<td>Descriptive listing</td>
<td>Adolescent interviewer read</td>
<td>10min</td>
<td>Daily activity interview</td>
</tr>
</tbody>
</table>
cocaine and prescription medication abuse. Tobacco was not measured as a primary substance of use as some teens (18 years and older) can legally use this and because, while it is important substance to address, in the United States there are no treatment programs specifically for tobacco, thereby reducing its relative clinical significance as compared to other substances. Substance users reported that more of their social network members used substances, that they were more depressed, more stressed, and that they participated in more negative activities with their social network members compared to nonusers ($p < .05$). Risk analysis revealed that those teens with social network members who were substance users were almost 16 times as likely to be substance users themselves (odds ratio 15.9, CI 15–16.9, $p < .01$); those teens with network members who were daily substance users were twice as likely to be depressed (odds ratio 2.4, CI .94–6.2); and those teens with network members who were daily users were 3.5 times as likely to have significantly elevated stress symptoms as compared to those teens with no daily substance users in their network. Finally, substance using teens’ networks were more dense and multiplex as compared to nonsubstance users.

Case Study: The Case of Natasha

We have constructed the subject of our case study from actual information, combined to disguise actual persons. Natasha, a pseudonym, is an 18-year-old, African American female who is a substance user living in an economically impoverished environment. Based upon the 2000 census, the block group where Natasha resides ranked twenty-seventh (out of 425 District of Columbia block groups) with respect to percent of family living in poverty. In her block group, 41% of all families live in poverty. We compared Natasha’s outcomes to the rest of our sample. As noted, substance users’ average score was 30.5 on the Adolescent Drug Involvement Scale (ADIS) indicating a level of substance involvement as serious drug involvement but not diagnosable as abuse or dependency. Natasha’s ADIS score was 28 revealing that her drug use is on the cusp of being defined as serious drug involvement. Natasha’s score of 73 on the Children’s Depression Inventory compared to the mean users’ score of 52, indicates that she is very likely to be depressed, and her score of 15 on the Adolescent-Family Inventory of Life Events compared to the mean users’ score of 6.3, indicates that Natasha is experiencing significant stress in her family life.

Egocentric data (an individual reporting on their network, in contrast to full network data, where an entire defined group is reporting
about each other) have shown to be a relatively reliable indicator of youth social network characteristics, both at the macro (number of friends) and the micro (closeness with members) levels (Clair et al., 2003). Natasha’s social network is completely dense (100%) and highly multiplex (80%). She desires a complete change of membership in her network, is less close to her members, engages in fewer positive activities and more negative activities as compared to our sample of users and non-users. Forty percent of her network is made up of substance users, which is less than the average substance user membership in our sample (54%). Network member substance use was determined by the index subject’s report of their members’ substance use including alcohol and all other commonly abused substances, but excluding only tobacco use or sips of alcohol.

Natasha’s social network profile is graphically illustrated in Fig. 1. Natasha is represented as the three-dimensional cylinder surrounded by

![Figure 1](image-url)
five network members. Four of her members are female (circle) and two are substance users, as is Natasha (+ = use; − = nonuse). Natasha misuses prescription pain medication, which she receives from a family member. By most accounts, having a substance user within the home makes treatment more difficult for the individual seeking help. At this point Natasha has not formally sought treatment, but has indicated her displeasure with her social network and her desire to change her network. Members 1 and 5 live in her household (shortest arrows), members 3 and 4 live in her neighborhood, and member 2 lives 10 min away by car. Natasha feels the closest to members 1, 2, and 5 (thickness of arrow) and considers these relationships to be positive (solid line). Members 3 and 4 are perceived as not very close (thin line) and these relationships are perceived to have a negative affect on Natasha (broken line). Natasha’s network is very dense; all members know each other (connecting arrows). Member 1 is considered to be very close and have a positive influence on Natasha, even though this member is an 18-year-old female who uses heroin and alcohol daily. Natasha has daily contact with this member and has known her for six years.

Natasha has an average monthly ratio of one positive activity to seven negative activities with member 1. Natasha perceives this member to have no influence on her life. In contrast, member 2 is a 19-year-old, nonsubstance user who is also considered to be very close and to have a positive influence on Natasha. Natasha has weekly contact with this member, and has known her for five years. Natasha has an average monthly ratio of 52 positive activities to zero negative activities with this member. Natasha perceives member 2 to be very influential in her life.

Geographical Analysis: Full Sample and Case Study

The geography of risk and protection was initially measured by the Ecological Interview (described earlier) that produced a geographically specific listing of the teen’s daily activities, as well as evaluative descriptions of various specific settings. This interview probes teens as to where they go, what they do, and with whom they do it with, on a typical week. We ask the teens to tell us specific geographical information of their locations such as addresses, cross streets, names of parks, metro stops, coffee shops, and landmarks. We ask teens to tell us what network members are typically at each setting they have listed. For example, a teen may say, “Suzie is with me at the club, park, church, and my apartment; and Juan is with me at the club, school, and at his house.” We then ask the teens which is the most important (having the biggest impact
on your life, most meaningful); most risky (the place where you are most likely to engage in risky or dangerous activities, cause trouble, or do illegal activities); and the safest (safest place from harm, danger, or the likelihood of engaging in risky or dangerous activities) place to you? Finally, we ask for an explanation in their own words of what makes these places important, risky, and safe.

We then used GIS to geocode these locations identified by the adolescents. This process allowed us to transform street addresses of these locations into pairs of coordinates. With a limited number of cases in our study, we were able to compute the linear distances between the homes of the users and the reported risky and safe places that they identified. We found that on average, the distance between the homes and the safe places for substance users was three times the distance between the homes and the risky places.

Natasha identified the safest, most important, and most risky locations from all of the places she identified throughout the Ecological Interview. When asked, what makes your church the most important place for you?, Natasha replied: “I am around a lot of positive things and people. We talk about the Lord.” When asked, what makes your church the safest place for you?, Natasha replied: “I don’t have to hear no gunshots, not around the crazy people that I am around every day.” Finally, when asked, what makes your friend’s house the riskiest place for you?, Natasha replied: “There are lots of gunshots, lots of people getting killed, lots of stabbings, and lots of arguments.”

As discussed earlier, the usefulness of GIS in this study relies upon the ability to derive spatial relationships among variables of concern. To conceal her true identity, the actual locations of her home and other identified places were randomly relocated within the respective block groups. Figure 2 georeferences Natasha’s identified locations indicated during her Ecological Interview. The riskiest location is her friend’s house (georeferenced by street intersection). This location is within her residential zip code area. The safest location is identified as the church she goes to, which is outside of her zip code area. For confidentiality, none of these locations are precisely shown on Fig. 2.

Natasha identified a friend’s home as a risky place whereas her church was a safe place. Using GIS, we found that the linear distances between her home and these two places are 575 meters and 2319 meters respectively. In a sense, she traveled five times the distance to get to the safe place, compared to the risky place. We also examined the spatial distribution of poverty in the District of Columbia in relation to Natasha’s activity spaces. Although not in the poorest neighborhoods,
her general neighborhood has a relatively high percentage of family living under the poverty line.

To further evaluate her social ecology, we obtained other geographic information and were able to use GIS to characterize her environment. First, we obtained the DC Police Crime Reports (via the Washington Post Website) for the period from June 15, 2001 through March 9, 2002. These reports locate crime incidences to the street blocks. These data were then georeferenced using GIS. We focused upon three types of crimes: homicide, sexual assault, and robbery. Further, we also acquired a listing of liquor stores in the District and their street addresses were also georeferenced. Positive or protective resources, such as libraries and boy-and-girl clubs within the District were also included. We constructed a circle with a one-kilometer radius around Natasha’s home and the other three places she identified, regardless of the level of self-rated risk. These circles roughly suggest the areas that she might reach within walking distance. The GIS not only allows us to construct these circles but also enables us to extract features, such as number of liquor stores and crime incidences within the circles. We can calculate distance between reference points as well as count posited risk and protective variables within these...
kilometer circles. These circles can be moved to any reference point to help
understand the posited risk and protective features of various settings
that Natasha frequents. For example, we could move the circle to her
school and create a profile of this neighborhood, in consultation with
Natasha to confirm their risk and protective features. Figure 2 illustrates
the geography of reported risk and protection within Natasha’s spheres of
activities.

In Natasha’s case, 24 homicides, two sexual assaults, and 457
robberies occurred within the one-km circles of activities during the
nine-month period (June 2001 through March 2002). Respectively, these
constituted 22%, 4%, and 20% of the total incidences in DC. A web-based
search of the DC yellow pages indicated that there are 25 liquor stores
from our sample of 126 stores, located within the one-km circle of
activities. In terms of positive resources, as examples, we used public
libraries and boys-and-girls clubs. For this study, we used linear distances
as estimates of accessibility, that is to say, resources located closer to
Natasha should be more accessible than those located farther. We
obtained all the addresses for the 24 DC public libraries as well as the boys
and girls clubs, georeferenced them, computed the distances between
these locations and Natasha’s home. We found that a branch library is
located just around the corner from Natasha’s home, representing
a potential safe/protective activity space. However, it is noted that
teens at a library without adult supervision can still get into trouble,
underscoring the relativity of safe and risky locations. The average linear
distance to the public libraries is 4954 meters. There are only six boys-and-
girls clubs in DC. The closest one is located 3790 meters away from
Natasha’s home and the average linear distance is 5735 meters. It is
important to note that these are linear distances and can be considered
very conservative estimates as traveling through the city requires far
more complicated routes. Linear distances are straight lines between
points in contrast to the human experience in DC, where one may not
have direct access to various points. Nevertheless, we were able to
demonstrate that Natasha’s access to these positive resources is limited.

Three-Dimensional Risk Profile

In an attempt to understand the personal, social network, and
environmental risk of urban youth, we created a three-dimensional risk
profile. Figure 3 illustrates the case of Natasha in terms of personal,
social network, and environmental risk and protective factors. Arrows
pointing up indicate increased risk and arrows pointing down indicate
increased protection. For each domain, a risk-to-protection ratio was calculated for Natasha. Her personal risk domain is one protective factor to three risk factors; her social network domain risk is five protective factors to three risk factors, and her environmental domain risk is two protective factors to five risk factors. The overall risk profile ratio for Natasha is eight protective factors to 11 risk factors (8:11). A goal for Natasha would be to collaborate on ways to try to level-out her risk profile and then ultimately tip this ratio toward having more protective than risk factors by addressing her individual, social, and environmental issues.¹ This attempt to utilize a profile is both highly specific (personal and social risk and protective factors) and general (locations of risk and protection are fluid, subjectively changing in relation to known risks such as local crime, etc.). A more sophisticated weighted risk-to-protection ratio would allow for a more sensitive and accurate profile for Natasha. For example, more weight would be assigned to a daily heroin user in a network than to an occasional beer drinker. Nonetheless, this profile can serve as an intervention tool to bring spatiality into the mix of personal and socially based prevention programming.

¹An example of this method is described in the second paragraph of the Prevention Implication section below
The work described in this article is founded upon a transdisciplinary framework of collaboration and is directed at understanding the complex needs of modern urban youth and their social ecologies. Through combining community and prevention science, pediatric medicine, geographical analyses, and linking environmentally based epidemiology with social network analysis, we sought to expand the focus on adolescent health behavior. By acknowledging the strengths and limitations of various disciplines and their accompanying methodologies and theoretical assumptions, we are producing multilevel, contextually relevant data that will contribute to models for future prevention research with urban youth. This project has a transdisciplinary goal to generate in-depth, culturally specific information of the social network structural properties, environmental influences, and associated meanings for urban adolescents that can be applied to salient substance use prevention approaches. These prevention approaches would take into account the unique and specific contextual forces that impact urban youth.

For example, as technology becomes more integrated into medical practice and public health initiatives, the implications using these tools to assess a risk/protection profile and access safe environments for adolescents that present to primary care is encouraging. These tools could aid the community pediatrician to more thoroughly understand the environment and social network that the adolescent operates in. This would be helpful in a number of situations, not just in the prevention of substance use and misuse. One common situation where it could be helpful is in the treatment of obesity and other disorders in adolescents. Typically the doctor will recommend an exercise regimen as part of the plan to increase fitness. With knowledge of safe and unsafe places in the teen’s neighborhood, the physician can devise a more realistic plan for outdoor or indoor activities based on the environment and resources available in the area and home where the patient lives and is active. Further, by examining the teen’s social network quality, the physician could strategize a plan to increase time with more physically active members. This work reveals that there are public health implications to helping make safe areas more accessible to adolescents and the community more aware of these locations in order to encourage youth to go there and away from unsafe areas. Doctors and parents are not always aware of the safe and unsafe environments their patients and children are in after and before school, for example. Integrating this technology into a busy clinical practice that is not supported by a research project is a challenge and one that most likely will need further research to justify...
the infrastructural support necessary (e.g., data collector, GIS technician, software and hardware, data interpreter, and treatment planner).

**PREVENTION IMPLICATIONS**

The results of this study shed light on the methodological possibilities of understanding the complex social and geographical ecologies of urban adolescent substance use. This in-depth description provides a foundation for locally informed and culturally relevant substance abuse preventive interventions that take into account the specific contextual forces that impact urban adolescents, as well as a methodology for adapting prevention programs to other locales. While the data collected regarding the geography of risk and protection were specific to this locale, the methodology can be adapted in other settings to address almost any topic that is measured on social indicators. These data begin to illustrate that the ecological settings of urban adolescents’ lives can inform prevention by recognizing the significant connections between teen’s coparticipants of their lives (social network members) and the everyday settings in which their behaviors are expressed (risky, neutral, and protective locations). These data empirically demonstrate that this sample of teens live in an environment where they have to put in extra effort to avoid risk by having to travel much further to get to their safe places.

The three-dimensional profile has preventive applications that extend the risk/protective factor model to literally include the environment as a point of clinical concern as well as a data point for analyses. Prevention efforts can use the descriptions of the teen’s social networks to begin to create a risk/protection profile. This type of profile could aid prevention and treatment providers as well as mobilize community action toward developing more positive, safe, and protective spaces for urban adolescents to be active in. If prevention programs were to be able to provide a work-up of a youth’s risk and protection profile, this could serve as a specific intervention guideline. This profile then could be used to formulate a relevant and meaningful intervention plan on multiple levels.

**Personal, Social, and Environmental Preventive Implications**

With the case of Natasha, she would require immediate attention to her severe depressive symptoms, as well as her substance use. Natasha would be further evaluated regarding her substance use, depression, and stress and a subsequent treatment plan would be enacted to provide the
necessary psychological or psychiatric interventions to address these
significant concerns. Simultaneously, we would recommend making
changes in her social network by decreasing time with users and increasing
time with her more positive, nonusing friend. Specific social skills such
as refusal skills, handling criticisms, and communication skills would be
taught to help facilitate her confidence, and social skill competence in
manipulating her network. Specific network tasks such as investigating
and joining afterschool groups or clubs that could provide more pro-social
support in safe, positive settings, would be assigned and monitored.

Finally, Natasha’s geographic risk profile would be targeted to stra-
tegize ways of increasing time at protective locations, such as libraries,
Boys and Girls Clubs, and finding realistic, alternative routes and
creative pathways to stay away, as much as possible, from high-risk
locations like her friend’s house or other high-risk settings. Mapping
alternative bus or subway routes, walking paths, and short cuts that
provide more time in safe locations could serve as an engaging
collaborative activity between the interventionist and the urban youth.
Further, Natasha would be encouraged to explore mapped community
and/or city resources that could assist her with transportation, long-term
mental health assistance, and career/economic guidance.

In this study, teens rated the Ecological Interview and the Social
Network assessment as the most interesting of the assessment battery,
revealing that their activity spaces and social networks are of importance
and have meaning to them. Our research team hopes to pursue the
qualitative approach to understanding urban teen’s lives through such
methods as photovoice, where urban teens are documenting their own
visual perceptions of the environment, which helps in interpretation and
understanding their multiple worlds. We hypothesize that this type of
creative activity would further engage the teens into a partnership/
collaborative relationship with the research team and, therefore, would
likely produce more accurate data, while benefiting the participating teen
through maintaining and even increasing the sense of self-efficacy.

Community-Based Preventive Implications

Group profiles for youth affiliated with particular neighborhoods
could serve as tools for community development, strategic planning for
agencies, and social data for policy makers. This type of research can
demonstrate that these neighborhoods have numerous strengths as well
as challenges, but that often the ratio is lopsided towards risk for many
low-income urban youth. For example, a risk-to-protective ratio could be
calculated for an entire neighborhood. This profile could then be
geocoded to display the linear distances between risk and protective sites
and the spatial distribution of safe and healthy locations as compared to
risky settings. When this type of specific, empirical profile is then linked
with specific preventive interventions that teach youth social network
skills and raise awareness of locations of risk and protection through the
integration of these local reference points into a prevention plan, the
intervention takes on a more relevant, real, and useful tone to
participants. It catches their attention and their interest.

CONCLUSIONS

The goal of this project was to systematically describe substance
using and nonusing urban adolescents’ social networks and related health
outcomes as well as their risky and protective environmental settings.
This study provides support for understanding urban adolescent
substance use through the detailed and multiple dimensional analysis of
teens’ social ecologies. We believe that these methods can contribute to
models for future prevention research with both high-risk urban youth as
well as to maintain the phenomenon of a range of needed protection for
developing low-risk youth. Three-dimensional profiles provide a unique
ingredient to preventive interventions that can be more relevant, highly
specific, and thus more likely to be effective.

This new strategy and method seeks to extend the Ecodevelopmental
Model (Szapocznik and Coatsworth, 1996). The challenge for this
method is to integrate its individually tailored design with an applicable
group approach to reach larger numbers. Further, caution must be
heeded about the use of the GIS technology. Privacy concerns must be
paramount for researchers as well as focusing the technology in the
service of prevention practice and not for the creation of interesting
maps. This technology is an exciting interactive tool that can be updated,
made culturally relevant, and enhanced by those very people who should
be served in the research process.

GLOSSARY

Adjacency: A spatial concept describing the state of being adjacent;
contiguity.

Connectivity: A spatial concept describing spaces that are serving or
tending to connect.
Constructive Expression: An expression or communication that is serving to improve or advance; helpful.

Exosystem: A developmental system within a complex interactive model of nested environmental structures in which the child is not an active participant, e.g., social services, mass media, etc.

Geocoding: A process by which a specific location is given a label identifying its location with respect to some common reference point.

Geographic Information Systems: A powerful set of tools that captures, manages, analyzes, and visualizes spatial data.

Georeferencing: A process by which a specific location is given a label identifying its location with respect to some common reference point.

Macrosystem: A developmental system within a complex interactive model of nested environmental structures that represents cultural traits and ideological beliefs, e.g., French culture, political ideology.

Mesosystem: A developmental system within a complex interactive model of nested environmental structures that represent the interaction among the microsystems. These relationships do not include the child directly but are considered to indirectly influence development, e.g., family-neighborhood relations.

Microsystem: A developmental system within a complex interactive model of nested environmental structures which represent the most proximal system for the developing child. Elements of this system are ones in which the child participates directly, e.g., family, school, peer group, and neighborhood.

Social Network: The people with whom one has contact at least once per month and with whom one has a meaningful relationship. This means that one feels at least some influence from the network member (positive or negative) through some kind of social contact.

Social Network Skills: A subgroup of social skills that are directly related to the identification, development, and maintenance of social networks.

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REFERENCES


Substance Use, Social Networks, and Geography


**Author Queries**

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