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Neighborhood Effects on the Efficacy of a Program to Prevent Youth Alcohol Use

Scott Yabiku, **Stephen Kulis**, **Flavio Francisco Marsiglia**, **Ben Lewin**, **Tanya Nieri**, and **Syed Hussaini**
School of Social and Family Dynamics and School of Social Work, Southwest Interdisciplinary Research Center, Arizona State University, Tempe, Arizona, USA

Abstract

This study examines how neighborhood characteristics affect program efficacy. Data come from a randomized trial of a substance use prevention program called *keepin' it REAL*, which was administered to a predominantly Mexican American sample of 4,622 middle school students in Phoenix, Arizona, beginning in 1998. Multilevel models and multiple imputation techniques address clustered data and attrition. Among less linguistically acculturated Latinos, living in poorer neighborhoods and those with many single-mother families decreased program effectiveness in combating alcohol use. High neighborhood immigrant composition increased program effectiveness. Unexpectedly, the program was also more effective in neighborhoods with higher rates of crime. There were no significant effects on program efficacy for the more linguistically acculturated Latinos and non-Hispanic White students. Findings are discussed in light of theories of neighborhood social disorganization, immigrant adaptation, and social isolation.

Keywords

substance use; adolescents; neighborhoods; neighborhood effects; Latinos; Mexican Americans; acculturation; prevention; program efficacy; social control; social cohesion; social capital; treatment

Introduction

An important indicator of a substance use prevention intervention's efficacy is a decrease in substance use among participants compared to a population that did not participate in the intervention. The question of efficacy is important for policy-makers and other stakeholders who must decide if it is worthwhile to implement a given prevention program. Researchers have begun to explore whether prevention efforts are effective for certain subgroups; e.g., among participants of different ethnic and racial groups, different genders, and different socioeconomic statuses. Overall program efficacy, along with differences in individual subgroup efficacy, form fundamental metrics for assessing a specific intervention's effectiveness in a population. Less systematic attention has been directed toward understanding how institutional settings and social contexts impact prevention programs—partly because randomized trials that test for prevention program efficacy are often designed to hold these constant. These settings and contexts include variations in agency, school, or

Address correspondence to Dr. Scott Yabiku, School of Social and Family Dynamics, Arizona State University, Tempe, AZ 85287-3701. scott.yabiku@asu.edu.

community resources, and in their organizational structures and climates (Hawkins, 2002; Hawkins, Van Horn, and Arthur, 2004). In this article, we examine a dimension of program effectiveness that is frequently overlooked: the neighborhood context.

Researchers examining youth well-being have found that neighborhood factors are associated with a broad set of outcomes, including mental health, delinquency, substance use, and child development. The most salient neighborhood influences include neighborhood poverty, crime, unemployment, social cohesion, social capital, and socio-economic isolation (Aneshensel and Sucoff, 1996; Brooks-Gunn, Duncan, and Aber, 1997; Crum, Lillie-Blanton, and Anthony, 1996; Elliott et al., 1996; Sampson, Morenoff, and Earls, 1999; Simcha-Fagan and Schwartz, 1986). This wealth of studies from several disciplines is strong evidence that the context of a young person's neighborhood has important consequences for that young person's health and quality of life.

Given the link between youth outcomes and the neighborhood, it is puzzling that few researchers have examined variations in program effectiveness by neighborhood. Programs created and implemented in one kind of neighborhood may not be as effective in others. Theory suggests that there may be a number of neighborhood processes that may interact with programs, such as social cohesion and solidarity, social disorganization, social modeling, and isolation. In other words, some characteristics of neighborhoods may reinforce program effects, making them even more effective. On the other hand, other characteristics may work against programs, making success difficult. Isolating what neighborhood characteristics can help or hinder program interventions has both theoretical and practical importance.

In this paper, we examine the neighborhood variation in program effectiveness for a culturally grounded substance use prevention curriculum called *keepin' it REAL* (Refuse, Explain, Avoid, Leave). The efficacy of this curriculum for preventing adolescent substance use was tested in a randomized trial involving 35 middle schools in the Phoenix area starting in Fall of 1998. The *keepin' it REAL* program was demonstrated to be effective in delaying or reducing use of alcohol, cigarettes and marijuana, and in strengthening anti–drug use norms and attitudes (see Hecht et al., 2003, for details of the program, the randomized trial, and the results demonstrating its efficacy). The program was particularly effective in preventing initiation of alcohol use—the most commonly used substance among youth in the trial. Based on its demonstrated prevention effectiveness, *keepin' it REAL* was recognized as a model program by the Substance Abuse and Mental Health Services Administration (SAMHSA, 2005).

Background

Prevention research has begun to focus not just on overall program effectiveness, but also on subgroups of program participants who have the most, and least, favorable outcomes. This type of moderation or "internal analysis" investigates the characteristics of participants for whom the program is most, and least, effective (MacKinnon, Jo, Brown, Kellem, and Sobel, 2004; Greenberg, Kam, and Kusche, 2003; Spoth, Guyll, Redmond, and Project Family Investigators, 2003.) By examining "successful participant" characteristics, researchers gain insight into successful participants' resources, recruitment that targets participants who are most likely to benefit, and program adaptations to achieve even better outcomes for particular populations. Some research has shown how community-level factors, such as policies, institutions, and group social resources are associated with both adolescent "risk behaviors" (substance use and delinquency) and prevention interventions' impact (Hawkins, 2002; Hawkins et al., 2004, Wagenaar, 2003). However, intensive investigations of

neighborhood impact on program efficacy are rare and the mechanisms of the effects are still unknown.

Neighborhood Characteristics and Treatment Effects

Neighborhood influences on individuals is a persistent issue in the social sciences. Some of the most well known early sociological research comes from the Chicago School's work on neighborhoods and concern with social space and context (Abbott, 1997), and researchers have continued to investigate empirically how neighborhoods affect residents' outcomes. With this continued focus have come a variety of approaches to conceptualize neighborhood effects, several of which are useful for hypothesizing how program efficacy varies by neighborhood.

Ethnic Enclaves and Immigrant Adaptation Processes—Past research indicates that immigrants often have better socioeconomic and health outcomes when they are concentrated in immigrant neighborhoods (Wilson and Portes, 1980; Portes and Jensen, 1989; Portes, 1997; Landale, Oropesa, and Gorman, 2000; Landale, Oropesa, Llanes, and Gorman, 1999; Morenoff, 2003). This existing research suggests several mechanisms by which neighborhood immigrant composition influences the efficacy of school prevention programs located in those neighborhoods. First, immigrant neighborhoods may be closer knit and have more effective social control. The same social capital that permits immigrant firms to operate effectively (Portes, 1997) may also be pervasive at the level of social control of youth (Zhou, 1997). If youths in immigrant neighborhoods know they are under greater social control, this adds benefit to prevention programs that aim to reduce alcohol and drug use.

Second, certain immigrant communities may be less tolerant of substance use because it is incompatible with cultural norms. Foreign-born individuals have lower levels of unhealthy behaviors, including alcohol, cigarette, and drug use (Landale et al., 1999). If immigrant neighborhoods are already predisposed to have lower acceptance of substance use, then it is likely that prevention programs will find fertile ground for their message.

Third, research consistently finds that first generation immigrants are a selective group with higher levels of motivation and industry than native-born or later-generation individuals. Children who come to the United States as immigrants often exceed subsequent-generation children in educational attainment, wealth, and occupational mobility. Immigrant neighborhoods may have higher proportions of motivated individuals who are willing to reinforce positive behaviors. This effect augments the already high social control present in immigrant neighborhoods, potentially making prevention programs even more effective.

In sum, ethnic enclaves and immigrant neighborhoods are characterized by their members' anti-drug norms, greater motivation to succeed, and greater social cohesion. These factors make for a receptive environment for prevention programs, reinforcing anti-drug messages, motivating youths to adopt and refine their newly learned life and resistance skills, and providing social support for behavioral change.

Social Disorganization—The social disorganization framework suggests that neighborhoods afflicted with crime and poverty or with many single-parent homes create conditions that result in poorer outcomes for adolescents. Past research has shown that high neighborhood poverty is associated with delinquency and drug arrest rates (Chow, 1998), more "hard" drug offers to adolescents (Crum et. al., 1996), more pro–substance use norms, and more frequent observation of drunk or "high" people on the street (Kadushin, Reber, Saxe, and Livert, 1998; Raudenbush and Sampson, 1999). The stress caused by life in crime and violence-ridden neighborhoods is another potent predictor of adolescent alcohol and

other drug use (Schier, Botvin, and Miller, 1999; Dembo, Schmeidler, Burgos, and Taylor, 1985). Although past studies document neighborhood poverty, crime, and a high concentration of single-mother families as increasing adolescent risk for substance use and misuse, there are also several related reasons why neighborhood social disorganization may influence prevention program efficacy.

First, social disorganization may lead to lower social control of youth. Crime, poverty, and residential instability decrease residents' ability to know each other and, subsequently, reduce the neighborhood's "informal social control"—such as neighborhood adults disciplining children who are not their own (Pattillo, 1998). Social control of youth is also diminished when children come from non-intact families (Thornton, 1991), which may increase adolescents' risk (Coulton and Pandey, 1992; Oetting, Donnermeyer, and Deffenbacher, 1998; Sampson, 2001). Adults' fear of victimization or retaliation for disciplining youth may also decrease social control in high crime neighborhoods (Rountree and Land, 1996; Sampson and Raudenbush, 1999). Thus good theoretical reasons exist to expect that social disorganization—either in the forms of crime or non-intact families—will affect prevention efficacy: the lack of adult social control will mean that prevention messages will not be reinforced at home or by other neighborhood residents, thus reducing these programs' effectiveness.

Second, neighborhood social disorganization reduces the number of role models for adolescents. The neighborhood is an important context in which children are raised and socialized (Bronfenbrenner, 1989). Among inner-city African Americans, a lack of role models has been often cited as a factor in declining marriage rates and rising teen childbearing rates (Wilson, 1987; South and Crowder, 2000; South and Baumer, 2000). Harmful role models, in the form of highly visible and wealthy drug dealers, also distort adolescents' aspirations (Pattillo, 1998). Social modeling of neighborhood residents is also likely to happen with regards to substance use. If adolescents in these neighborhoods frequently see adults misusing drugs and alcohol, then substance use becomes a validated behavior and prevention programs are likely to be less effective.

In sum, socially disorganized neighborhoods are characterized by multiple risks. As such, they may operate to block prevention programs' success. Youths in these neighborhoods may view substance use as a desirable option and thus show no attitudinal or behavioral change after program participation. Substance use may seem to them a viable coping mechanism or pastime in the face of such concerns as hunger, pervasive crime or violence, family instability, untreated health problems, and substandard living conditions. Alternatively, while youths' attitudes may change as a result of an intervention, their behavior may be constrained by other factors. For instance, if safety is a concern, given pervasive crime, a youth may decide that walking home alone is less preferable to walking home with a drug-using friend, which may entail herself using drugs as well. The relative risk of substance use may be viewed as minor. Finally, even in cases where a youth exhibits behavioral change as a result of program participation, neighborhood disorganization may undermine the consistency of such change. A youth in an environment where drugs are widely accessible and actively pushed, for example, must successfully resist drugs not just one or two times, but many times. In contrast, a youth in a less disorganized neighborhood need only resist the few times he gets an offer. Social disorganization, then, may operate to block the integration of newly acquired prevention skills and knowledge into a regular pattern of behavior.

Social and Geographic Isolation—Although related to social disorganization, social isolation approaches focus on neighborhood structure and the under-representation of social institutions. Many urban neighborhoods became socially isolated when quality jobs moved

to the suburbs, accompanied by community organizations and institutions, such as churches, volunteer organizations, neighborhood groups, children's groups, libraries, and business associations (Rankin and Quane, 2000). The lack of neighborhood institutions has been associated with higher rates of crime (Peterson, Krivo, and Harris, 2000). Poor neighborhoods have fewer community institutions that can help "at-risk" adolescents, such as parks, libraries, after school programs, and community policing (Boardman, Finch, Ellison, Williams, and Jackson, 2001; Peterson, Krivo, and Harris, 2000; Pattillo, 1998). Conversely, in these same neighborhoods are many liquor stores and corner markets, in addition to known areas of illegal drug trafficking. This lack of beneficial community institutions may influence prevention program efficacy through two mechanisms.

First, in addition to lacking social capital and collective efficacy that provide informal social control, isolated neighborhoods also lack the institutions that provide more formal control of youth. Sampson et al. (1999) found that social control of children was positively associated with the presence of neighborhood organizations and services: block groups, tenant associations, crime prevention programs, youth centers, mental health services, and after-school programs. Less formal social control of youths means less reinforcement of prevention messages, decreasing a program's effectiveness. Second, poor neighborhoods may have greater alcohol and illegal drug access. Research shows that when parents rated their neighborhoods as having high drug activity, children had more alcohol, cigarette, and marijuana use (Ennett, Flewelling, Lindrooth, and Norton, 1997). Thus, prevention programs in poor neighborhoods may be less effective because children have greater access to drugs.

Prevention programs based on life skills and social competence enhancement implicitly assume that there are better ways than substance use to have fun or cope with problems. However, in socially or geographically isolated neighborhoods, where sufficient support and recreation services are lacking, prevention programs may not only fail to prevent substance use but also unintentionally provoke it by creating unrealistic expectations and subsequent frustration among participating youth.

Prevention in Risky Neighborhoods and Youth at Risk

As argued above, prevention effectiveness may be undermined by neighborhood factors that exacerbate youth risks due to less effective social control, fewer positive role models, and a paucity of institutional supports. However, there is a parallel perspective that bears consideration. Who is most likely to benefit from prevention programs: high-risk youth or low-risk youth? At the neighborhood level, will accumulated community risks—more exposure to drug use opportunities and less social control—undermine program efficacy, or will the larger number of adolescents at risk result in larger gains from prevention efforts? It is possible that substance use prevention programs can have their greatest impact in situations where youth are beginning to initiate substance use at very high rates, and have their weakest impact in more socially sheltered neighborhoods where youth substance use is less common and the social environment is supportive of non-use. Our prediction follows the prevailing view in the neighborhood effects literature that suggests that risky neighborhoods will increase the need for prevention while also undermining its effectiveness. Regardless of whether prevention programs find more fertile ground in neighborhoods at greatest or at least risk, this issue highlights the importance of controlling for individual-level risk factors when assessing neighborhood effects.

Data and Methods

At the start of Fall of 1998, the *keepin' it REAL* youth substance use prevention study was initiated in 35 middle schools in Phoenix, encompassing more than 75% of all middle

schools within the city boundaries. While most (n = 21) of the schools were in lower income Hispanic neighborhoods, the sample also included two schools in wealthier, non-Hispanic White areas. In the study schools, all students in the seventh grade participated after passive parental consent was obtained for the survey component of the study in accordance with school district and university human subjects protections. Prior to implementation of the prevention program, students in all the schools completed a pre-test survey instrument that measured the adolescents' experiences with substance use, norms towards substance use, and family and individual background characteristics. These surveys were self-administered on school days (non-holidays) in classrooms and were available in both English and Spanish (one side of each page was in English, the other in Spanish). Survey administrators, not teachers, responded to any questions students had while taking the survey, thus ensuring that teachers did not influence students' responses. Some students were not present on the day in which the survey was given, but across the entire study, 87% of officially enrolled seventh grade students completed the survey. Immediately following the pre-test survey, a substance prevention program was initiated in 25 of the 35 schools. The assignment of schools to treatment or control conditions was accomplished through block randomization that controlled for the size and ethnic composition of schools. In the late spring of 1999, a follow-up questionnaire survey was administered once again to all 7th-grade students in all schools, approximately two months after delivery of the prevention program curriculum had been completed in treatment schools. This survey replicated many of the measures in the pre-test surveys so that potential treatment effects could be measured reliably. (See Hecht et al., 2003, for details of the design of the randomized trial.)

The prevention program, named *keepin' it REAL* for the drug refusal skills (i.e., strategies for resisting drug offers and use) it teaches (Refuse, Explain, Avoid, Leave), was developed *by youth for youth*, using the participatory action research method to ensure community empowerment (Gosin, Dustman, Drapeau, and Harthun, 2003). It is a culturally appropriate intervention incorporating traditional ethnic values and practices that promote protection against drug use (Castro, Proescholdbell, Abeita, and Rodriguez, 1999). In accordance with the best practices literature (Gosin, Marsiglia, and Hecht, 2003), the program specifically incorporates aspects of traditional Mexican American culture—the ethnic background of the majority of students—into the 10-lesson, classroom-based curriculum, taught by trained teachers, that extends evidence-based resistance and life skills models (Botvin, Griffin, Diaz, and Ifill-Williams, 2001) using a culturally based narrative and performance framework (Holland and Kilpatrick, 1993). The objective was to enhance anti-drug norms and attitudes and to facilitate the development of the students' risk assessment, decision-making, and resistance skills. For details of the curriculum design, including its theoretical basis and the qualitative phases of the research that utilized drug resistance narratives and communication styles of the local population and the incorporation of relevant cultural group values to develop lesson content, see Holleran, Dustman, Reeves, and Marsiglia (2002) and Gosin, Marsiglia et al. (2003).

In addition to data collected in the substance prevention program, our analysis incorporates neighborhood data. We gathered neighborhood data from a combination of U.S. census sources and Phoenix municipal data. Students in a school were assigned the neighborhood measures from the census tract(s) corresponding to the school's official enrollment boundaries. These boundaries, carved through 10 separate school districts, yielded 35 school enrollment areas using data obtained from the Arizona Department of Education. We acknowledge that the geographic area of the school may not be the same area in which the students live. Although parents can request to send their children to schools outside the official school boundaries in which they live, both within and across school districts, such transfers are uncommon and nearly all children within each area live nearby. In addition, there is good reason to believe that the neighborhood characteristics of the school will

influence program effectiveness even for children whose homes are elsewhere. The school is a location that students frequent on a regular basis, and thus exposure to the school's neighborhood characteristics is likely to be high, forming another context in which young people receive socialization (Bronfenbrenner, 1989).

Substance Use Outcomes

The dependent variable is recent alcohol use, which was measured with two questions. The first asked, "How many drinks of alcohol have you had in the past 30 days?" Responses were ordinal categories on a 9-level scale, with categories such as none, only sips, part of all or one drink, 2 or 3 drinks, and 4–7 drinks. The highest category was more than 30 drinks. The second question concerning alcohol use asked, "How many days in the past 30 days have you had alcohol to drink (do NOT count for religious services)?" Responses to this question were also in six ordinal categories, ranging from none up to the highest category of 16–30 days. Both variables, highly skewed toward non-use of alcohol, were transformed with a logarithmic function. Because the prevention program was designed to bring about immediate behavioral and attitudinal changes, we use the first of three post-test measures of alcohol use for comparison to the baseline measure. Note that the long-term efficacy of the prevention program has already been demonstrated (Hecht et al., 2003), but how neighborhoods influence the program's efficacy has not been previously explored. Thus for our analysis we focus on the role of the neighborhood on program effects from baseline to the first post-test, where the influence of the neighborhood is likely to be strongest. With the passage of time from when neighborhood characteristics were measured (close to baseline), these indicators become less accurate in describing the neighborhoods. Neighborhoods in Phoenix can change rapidly due to large population movements. In addition, later post-test measures would increasingly incorporate outcomes, through multiple imputation of missing data, of students who had moved out of their original neighborhoods

Although the surveys asked students about several kinds of substance use, including alcohol, cigarettes, marijuana, and inhalants, as well as attitudes and norms regarding usage, we focus exclusively on recent alcohol use for several reasons. First, among this age group (seventh grade) alcohol is the drug of choice and thus is most widespread and relevant for this population. Alcohol was the most frequently utilized substance, used by over 22% of the pre-test respondents within the last 30 days and by over half in their lifetime, while recent cigarette and marijuana use were less common (by 13 and 14% of respondents, respectively). Second, use of some other substances was too rare to be effectively studied. For example, only 5% of pre-test respondents reported any lifetime use of cocaine, crack, LSD, PCP, heroin, downers, speed, or crystal methamphetamine.

Neighborhood Characteristics

Using ArcView (GIS) software, neighborhood level variables were constructed by spatially reconfiguring from census tracts to the school enrollment boundaries. School enrollment areas were generally larger than small, inner-city census tracts. When a school enrollment area spanned census tract boundaries, data was apportioned from each of the census tracts falling within the area. Thus, if 50% of a census tract fell into an area, ArcView would designate 50% of the population within that tract to that area.

Three neighborhood level variables were constructed from the 2000 U.S. Census Summary File 1 or Summary File 3. These included the percentage of all residents in the school enrollment area who indicated that they were: (a) immigrants to the United States within the last 5 years, (b) in families headed by a single-mother; and (c) in families with incomes below the official U.S. poverty line. A fourth variable—the violent crime rate per 1,000 people—was constructed from Phoenix Police Department reports that provided the

geographic location of crimes. Following our theoretical framework, these four neighborhood measures aim to reflect several neighborhood mechanisms that might interact with treatment effects: immigrant adaptation (recent immigrant composition), social disorganization within the family (single-mother families), social disorganization in the neighborhood (crime), and neighborhood isolation and disadvantage (poverty).

Prevention Program Indicator and Individual-level Measures

Because our aim is to assess how program effects vary by neighborhood, it is necessary to include in our models a treatment indicator. This indicator is coded 1 if the school participated in the program, and 0 otherwise. Recall that participation was randomly assigned, with 25 of the 35 schools, and 75% of the student participants, receiving the program.

As control variables we use several measures that have been established as predictors of substance use. These include gender, academic performance, and socioeconomic status. Academic performance was the students' self-reported grades, which was measured on a scale from 1 (mostly F's) to 9 (mostly A's). Socioeconomic status was captured with a dummy variable that indicated if the students received free or reduced lunches through the federal school lunch program. Because students may not accurately know their household income, free or reduced lunch status is a frequent way of collecting socioeconomic measures from school-based surveys of students (Bankston and Caldas, 1996; Gerard and Buehler, 1999).

A last important individual-level measure of the students is their race, ethnicity, and acculturation status. Race/ethnicity was self-reported on the surveys. Students could select multiple categories. In the study population, the sample was overwhelmingly Latino (over 66%), with non-Latino Whites as the second largest group (14%), and all other race/ethnic groups having only minimal representation. This large Latino population, however, contains important subgroups that differ by their level of acculturation and language skills. A wealth of research shows that outcomes are associated with acculturation levels (Barnes, 1979; Beauvais, 1998; Bonnheim and Korman, 1985; Escobar, 1998; Gil and Wagner, 2000; Landale et al., 1999; Morenoff, 2003), and thus we capture one dimension of Latino acculturation with two measures of linguistic acculturation (Epstein, Botvin, and Diaz, 2000, 2001). The first question asked was "When you talk with friends, what language do you usually speak?" A second question was similar but referred to communication with family members. Responses were measured on a five-point ordinal scale that ranged from Spanish only, mostly Spanish, Spanish and English equally, mostly English, to English only. These two questions were averaged together, and students who averaged 3.5 or less were considered to be in the less linguistically acculturated group, and students greater than 3.5 were in the more linguistically acculturated group. Because processes of substance use and neighborhood contexts are likely to differ across different race, ethnic, and acculturation groups, we conducted analyses separately by subgroup: less linguistically acculturated Latinos, more linguistically acculturated Latinos, and non-Latino whites. There were too few students of other groups (e.g., African American, Asian, Native American) to conduct analyses for these subgroups. Also note that we investigated the possibility of white students who may be less linguistically acculturated, but virtually all White students were English-only speakers at home and with friends.

Analytic Strategy

We use special procedures to account for the multilevel, clustered nature of the data. Students were clustered in 35 different schools, and this clustering is a potential cause of deflated standard errors (Raudenbush and Bryk, 2002). Multilevel or hierarchical modeling

procedures incorporate the clustered data and protect against Type I error (wrongly rejecting the null hypothesis). PROC MIXED in SAS can estimate multilevel models with random intercepts, which allows for different schools to have different base levels of drug use (Raudenbush and Bryk, 2002).

Although the number of students answering questionnaires was 4,622 in the pre-treatment wave 1, attrition reduced the number of completed questionnaires in the follow-up wave 2 to 3,986 students. The most common reasons for attrition include non-attendance on the day of the measurement or moving to another school or district that did not participate in the drug prevention study. In addition to missing data from attrition, the questionnaires featured planned *missingness* to reduce respondent burden. In other words, all students answered a common core of key questions but did not answer all the supplemental questionnaire items. This kind of missing data is called missing completely at random (MCAR) because students were assigned which items were to be missing by the researchers.

To address missing data we use multiple imputation techniques (Allison, 2002), which have been used successfully in studies of program efficacy (Graham, Roberts, Tatterson, and Johnston, 2002; Hecht et al., 2003). Multiple imputation methods are ideal for addressing MCAR data. Unplanned missing data, such as missing items or subject attrition, require slightly stronger assumptions. The critical assumption for this kind of missing is that the data are missing at random (MAR), conditional on other non-missing attributes. Although this assumption cannot be tested, the assumption can be strengthened by including all relevant predictors in an imputation model even if they are not used in the analyses.

In our multiple imputation approach, we created 10 complete datasets. In addition to all the variables used in our analyses of neighborhood effects, the imputation models incorporated other measures related to substance use, including substance use norms, attitudes, and expectations. We then analyzed the imputed datasets with complete-data methods. The results of these complete-data analyses were combined to arrive at a single estimate that properly incorporates the uncertainty in the imputed values. We used SAS PROC MI and PROC MIANALYZE to create the datasets and combine the multiple analyses.

Results

Descriptive statistics are presented in Table 1. Recall that we have divided the sample into three theoretically relevant groups: less linguistically acculturated Latinos, more linguistically acculturated Latinos, and Whites. Table 1 presents means and standard deviations for variables used in the analyses, and because the results are separated by subgroup, they give a sense of the differences between groups in neighborhood and substance use experience. Alcohol use varied by subgroup, with more linguistically acculturated Latinos having the most use: they averaged 2.07 out of 9 on the number of drinks in the past month scale (where 1 = no drinks and 9 = more than 30 drinks), and they averaged 1.53 out of 6 on the numbers of days in the past month scale (where 1 = no days drinking and 6 = 16 to 30 days drinking). Less linguistically acculturated Latinos have the second highest alcohol use, followed by Whites.

In terms of neighborhood characteristics, less linguistically acculturated Latino students went to schools in neighborhoods that had higher poverty rates than the other groups. White students' neighborhoods had the highest prevalence of single-mother families, but they had the lowest crime rates. As expected, the neighborhoods with the highest percentage of recent immigrants were found in neighborhoods where less linguistically acculturated Latino students went to school. At the neighborhood level there was only one significant correlation among the measures of poverty, crime, single-mother families, and immigrant composition.

Neighborhoods with higher proportions of recent immigrants had higher poverty rates (r = .66), and the schools in these neighborhoods reported not only a high proportion of Latino students (r = .60), but a larger proportion of students from non-English-speaking homes (r = .80).

Whether or not a student was in a substance use prevention treatment school did not vary much across subgroups, but this was expected because the assignment of the treatment was random across schools in the study. Sex of the student did not vary substantially across subgroups, but White students reported the highest grades, and less linguistically acculturated Latinos reported the highest use of free or reduced school lunches at 94%. This was higher than more linguistically acculturated Latinos (81%), and substantially higher than White students (44%), suggesting more socioeconomic disadvantage for the less linguistically acculturated Latino students.

Table 2 begins the results of the multivariate models, focusing on the less linguistically acculturated Latino subgroup of students. Because we hypothesized that the effectiveness of the prevention program will vary by neighborhood characteristics, we estimated interaction models where the treatment indicator was multiplied by the neighborhood characteristics. A significant test statistic for this interaction term is evidence that treatment effects vary by neighborhood characteristics.

These interaction models, however, are sometimes difficult to interpret due to the presence of main effects and an interaction term. To simplify the presentation, we have decided to dichotomize the neighborhood characteristics into two groups and present separate analyses. For example, we dichotomized the percentage of single-mother families in a neighborhood into a high and low group, and we present models separately for each of the groups. These two separate models are easier to interpret than an interaction model. Note that conclusions based on the interaction models or the two separate models are essentially the same, and we present the dichotomized models for ease of presentation.

Table 2 focuses on the number of days in the previous month that students reported using alcohol measured at the time of the first follow-up after the treatment program. The dependent variable is the same in each of the 8 models in Table 2. What varies across the eight models is the level of the neighborhood characteristic. For example, the first model in Table 2 estimates the treatment effect for students in neighborhoods with low levels of single-mother families. The second model estimates the effect for students in neighborhoods with high levels of single-mother families. Recall that we hypothesized that single-mother families in neighborhoods is a form of neighborhood social disorganization, which lowers levels of supervision of youth and decreases appropriate role models for young people. Both of these mechanisms were hypothesized to decrease the effectiveness of prevention programs. The results in Table 2 are consistent with this hypothesis. In neighborhoods with low levels of single-mother families, students who participated in the program scored significantly lower on the number of days drank alcohol scale by .11 points. For neighborhoods with high levels of single-mother families, the substance prevention program had no effect, as indicated by the insignificant coefficient for treatment. Note that the difference in treatment effects between neighborhoods with low and high levels of single-mother families is significant: in a separate model (results not shown) that analyzed the entire sample but included an interaction between the treatment and neighborhood single-parent families variables, the interaction term was significant, confirming that treatment effects significantly vary by levels of single-mother families in neighborhoods.

Before turning to the other neighborhood characteristics, we briefly examine the effects of other variables in the models. As expected, the number of days drank alcohol in the previous

month at the time of the pre-test is significantly and positively associated with reported number of days drank alcoholic drinks at time of follow-up: student behaviors across time are likely to be strongly correlated. Males had higher days of use than females, but this was not significant. Students with higher grades scored significantly lower on the days drank alcohol scale, suggesting that academic performance protects against substance use. Lastly, free or reduced lunch status was not significantly associated with alcohol use.

In models 3 and 4, program effectiveness is tested in neighborhoods with high and low levels of recent immigrants. It was hypothesized that immigrant communities would enhance program effectiveness because immigrant communities have higher levels of supervision and social capital, may be less tolerant of substance use, and are selective of community members who wish to see young people succeed. The results are consistent with these hypotheses. For students in neighborhoods with low levels of recent immigrants, the substance prevention program has no effect. For students in neighborhoods with high levels of immigrants, however, the program significantly reduces the number of days drank alcoholic drinks in the previous month by .13 on the consumption scale.

In models 5 and 6, there is an unexpected result: substance prevention treatments significantly lower students' number of drinking days in high crime neighborhoods, but not in low crime neighborhoods. This finding is contrary to predictions that high crime neighborhoods suffer from social disorganization and social isolation—few role models, adults fearful of disciplining children, and a lack of supportive community institutions.

Lastly, models 7 and 8 show that program treatment was significantly associated with lower alcohol consumption frequency in low poverty neighborhoods, but not in high poverty neighborhoods. Contrary to the results with crime, this finding is consistent with a social isolation hypothesis in which high poverty neighborhoods lack institutions that might reinforce prevention messages and thus make program effectiveness decrease.

We also examined another dimension of alcohol use: the number of alcoholic drinks consumed in the previous month. Although this outcome was correlated with the number of days drank alcohol in the previous month ($r = .80$ for wave 1, $r = .75$ for wave 2), it is worthwhile to examine because it provides an additional check on the validity of the analyses in Table 2 if similar results are obtained. Because results were similar, we do not present the tables here. In brief, similar patterns were found for the role of neighborhood single-mother families and the proportion of recent immigrants in the neighborhood: program effects were strongest in neighborhoods with low levels of single-mother families and high levels of recent immigrants. There were no significant differences in program effects by the level of the neighborhood crime rate or poverty rate.

In sum, the results in Table 2 generally support the notion that immigrant neighborhood characteristics may protect against negative outcomes. High proportions of recent immigrants make treatments more effective, lowering the students' amount and frequency of consumed alcohol more so than for students in low immigrant neighborhoods. Hypothesized effects of social disorganization through high proportions of single-mother families were also supported by the analyses. Again, for both alcohol use outcomes, program effects were dampened when students' schools were located in neighborhoods with high proportions of single mothers. The effects of social disorganization through crime were less clear. For the amount of alcohol consumption scale, there was no difference in treatment across high and low crime neighborhoods, and in the frequency of consumption scale, the program was more effective in high crime neighborhoods—which was contrary to theory. Lastly, the effects of social isolation through poverty were partially supported, with significant effects in the

predicted direction for the frequency of alcohol use but not for the amount of alcohol consumed.

These results, however, are for only one of the three subgroups—less linguistically acculturated Latinos. We also replicated the analyses for the two remaining subgroups—more linguistically acculturated Latinos and White students. Table 3 repeats the analyses on days drank alcohol among more linguistically acculturated Latino students. Unlike the results for the less linguistically acculturated Latino students, Latinos with more English language use do not show significant differences in program effects across different neighborhood conditions. The only consistently significant predictor of use in these models is prior use. Although not shown, an analysis of the number of drinks consumed also showed no significant differences across neighborhood characteristics.

Similarly, Table 4 repeats the analyses for the White students. Like the more linguistically acculturated Latino students, White students do not exhibit different levels of treatment effects across the four types of neighborhood characteristics. Another analysis (not shown) on the number of drinks consumed also did not reveal differences in treatment effects by neighborhood. Although the null findings for these two subgroups is unexpected, it is a highly intriguing result that draws attention to the unique position of the less linguistically acculturated Latino students. Unlike the other two groups, less linguistically acculturated Latino students appear most susceptible to both beneficial and detrimental neighborhood influences on program treatments.

Discussion

The randomized trial of *keepin' it REAL* provided rich data to test program effectiveness in diverse neighborhood contexts. Drawing upon well-established theories of immigrant adaptation, social disorganization, and social isolation, we hypothesized how different neighborhood factors would hinder or help program goals. Furthermore, we divided our student population in the 35 schools into three relevant subgroups that represented important contrasts in the Phoenix metropolitan area: less linguistically acculturated Latinos, more linguistically acculturated Latinos, and non-Latino Whites.

In general, support for the hypotheses was found in the analyses of the less linguistically acculturated Latino student group. A higher neighborhood concentration of single-mother families decreased program effectiveness, as did neighborhood poverty. High immigrant composition of neighborhoods, on the other hand, increased program effectiveness. An unexpected result was that programs were also more effective in neighborhoods with higher rates of crime. Aside from this last anomalous finding, the other results are consistent with theories of social disorganization, immigrant adaptation, and social isolation.

Although neighborhood influences have previously been explored in many areas of youth outcomes and well-being, few studies have examined how neighborhood characteristics influence the effectiveness of adolescent substance use prevention programs. Studying the relationship between neighborhoods and these programs is not only of theoretical interest, but it is also of practical use for administrators and policy-makers evaluating how programs may operate in different neighborhood settings.

Just as other studies of neighborhood factors have shown that they have small effects on youth and adult risk behavior, we find that neighborhood effects on prevention program efficacy fall into a restricted and similarly small range, especially in comparison to individual level predictors. This is perhaps an inevitable result of the greater degree of variation to be found within than between neighborhoods (Duncan and Raudenbush, 2001). Our interpretation of these findings is limited by the fact that our neighborhood measures

include only structural factors—poverty, crime, and immigrant and single-parent family composition—rather than indicators of the social processes that they are hypothesized to represent, such as degree of social control, social disorganization, availability of positive role models, social capital, the level of "collective efficacy" for children, and individual perceptions of neighborhood dangers. We are unable to control for individual level differences in psychological functioning that may account for some outcomes, especially if they were implicated in selection bias that would affect neighborhood residence (which is doubtful in the case of children). Some of the neighborhood effects on program outcomes may reflect specialized settlement patterns in more recently developed Sunbelt cities like Phoenix, such as explosive population growth, a huge influx of recent immigrants from Mexico, a growing preponderance of Latino children in city schools, high residential mobility, low density, relatively low unemployment coupled with high poverty rates, and a much lower proportion of households headed by single-mothers than is typical in the cities of the Northeast and Midwest. To the extent that this combination of forces represents particular or unusual forms of urban development, it is possible that standard neighborhood measures such as crime rates may be proxies for other social dynamics that are not immediately apparent.

Yet perhaps the most intriguing finding is that significant variations in program effectiveness were present only among the less linguistically acculturated Latino group. Whites and more linguistically acculturated Latinos demonstrated no difference in program effectiveness by neighborhood characteristics. This is somewhat surprising given that other research has shown that more acculturated Latinos and non-Latino whites are at higher risk of substance use than are less acculturated Latinos (Epstein et al., 2000, 2001; Nielsen and Ford, 2001) and that culturally grounded prevention programs like *keepin' it REAL* deliver larger desired program benefits for more acculturated Latino adolescents precisely because they are at higher risk of initiating substance use than their less acculturated counterparts (Marsiglia, Kulis, Wagstaf, Elek, and Dran, in press). Perhaps individual-level characteristics for more acculturated Latinos and white students play an overwhelming role in their responsiveness to prevention interventions, one that overshadows any independent influence of neighborhood social contexts. That prevention programs among less linguistically acculturated Latinos appear to be more susceptible to neighborhood conditions is a double-edged sword. On the one hand, it reveals the benefits that immigrant culture and community factors may contribute to making substance prevention programs more effective. This finding may encourage designers of these programs to reach out to the heavily immigrant Latino communities to reinforce substance use prevention messages. On the other hand, the findings also suggest that programs targeting less linguistically acculturated Latinos are more vulnerable to negative neighborhood characteristics, such as poverty and concentrations of single-mother families. These dual possibilities provide fruitful points of departure and help define the agenda for further research that is needed on the role of communities planning for prevention interventions. On that agenda is future work to better understand the different mixtures of community values, drug use prevention needs, formal and informal resources, and program options (Hawkins, 2002; Shiner, Thorn, and McGregor, 2004).

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Biographies

Scott T. Yabiku, Ph.D., is assistant professor of sociology at Arizona State University. His research interests include family demography, population and the environment, and youth substance use. He has also examined how neighborhoods and communities are related individuals' outcomes in multiple settings, including the United States and Nepal. He is an affiliate of the Southwest Interdisciplinary Research Center (SIRC) and the Center for Population Dynamics (CePoD).

Stephen S. Kulis, Ph.D., is professor of sociology at Arizona State University (ASU), where he also is affiliated faculty in the School of Social Work and the Women's Studies department. He is the director of research and co-principal investigator for the NIH/NIDA–funded Southwest Interdisciplinary Research Center. His research has focused on the role of gender and ethnic identity in youth drug use, gender and racial inequities in professional careers, and the organizational sources of discrimination. His methodological expertise includes survey design and implementation, secondary data analysis, and contextual analyses of neighborhood and school-level influences on individual-level risk and protective behaviors. He can be reached through e-mail at KULIS@ASU.EDU.

Flavio F. Marsiglia, Ph.D., received his Ph.D. in 1991 from the Mandel School of Applied Social Sciences at Case Western Reserve University. Since 1994, he has been a member of the faculty of the Arizona State University School of Social Work where he is currently the Distinguished Foundation Professor of Cultural Diversity and Health and director of the Southwest Interdisciplinary Research Center (SIRC). SIRC is a research infrastructure development center funded by the National Institutes of Health/National Institute on Drug Abuse (NIH/NIDA). In addition, Dr. Marsiglia is the principal investigator of other NIH/NIDA- and CDC-funded research projects studying risk and protective factors associated with health outcomes among Mexican/Mexican American and Native American youth and their families. He is the co-developer of *keepin'it REAL*, a culturally grounded drug prevention intervention named a Model Program by SAMSHA. Dr. Marsiglia is the lead instructor for the *Diversity and Oppression in the Social Work Context* course sequence. He has published numerous research articles and book chapters in his areas of specialization and has coauthored with Stephen Kulis a forthcoming book entitled *Culturally Grounded Social Work*. Dr. Marsiglia and his SIRC colleagues have presented their research findings at conferences across the nation and at international conferences in numerous countries including Mexico, Canada, Uruguay, Spain, and Italy. Two of their current drug research projects are been conducted in partnership with Mexican and Spanish universities.

Benjamin Lewin is a lecturer in the Department of Sociology at Arizona State University. His research interests include medical sociology, recreational drug use and youth substance prevention programs, and the medicalization of deviant behavior. His current area of research explores the effects of pharmaceutical direct-to-consumer advertising on physician–patient interactions. More generally, his interest lies in the role that pharmaceutical companies have in determining lay health beliefs about disease and treatment.

Tanya Nieri, M.A., is coordinator of research at the Southwest Interdisciplinary Research Center. She has studied the influence of religiosity, weight perceptions, school characteristics, and neighborhood characteristics on youth substance use. In addition, she has examined the efficacy and effectiveness of a SAMHSA model youth substance use prevention program, *keepin' it REAL*, for diverse populations and in different local, national, and international contexts. Other prior work includes an examination of parents with co-occurring disorders in the child welfare system, the performance of a family drug court for substance-abusing parents in the child welfare system, body image among subgroups of Latino youth, and the effects of parent–child communication on adolescent risk. Her research interests center on issues of cultural identity and adaptation for immigrant and native populations, with special emphasis on people of Latin American origin. Nieri holds a master of arts degree in sociology and is currently completing coursework for a doctoral degree in Sociology with specialization in statistics and the sociology of health and illness.

Syed K. Hussaini is a doctoral student in Sociology at Arizona State University in Tempe and is a research assistant at Southwest Interdisciplinary Research Center (SIRC). His research interests at SIRC have focused on: (a) theorizing acculturation processes and developing models for acculturation (b) acculturation and its relation to acculturating behaviors (drug use) with Mexican American population particularly theoretical issues relating to measuring acculturation as a concept among 5th graders; (c) differential impact of linguistic acculturation on substance use; and (d) impact of globalization on acculturation and identity formation among recent immigrants in the borderlands and its relation to norm formation and substance use.

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Table 1

Means and standard deviations for variables used in the analyses, separated by student subgroups

	Latino					
	Less linguistically acculturated		More linguistically acculturated		White	
	Mean	SD	Mean	SD	Mean	SD
Alcohol use						
Alcohol drinks in past month, pre-test	1.84	1.62	2.07	1.85	1.65	1.44
Days drank alcohol past month, pre-test	1.42	0.94	1.53	1.09	1.35	0.91
Neighborhood characteristics						
Percent single mother family	24.33	6.11	24.41	5.73	24.96	4.27
Percent poor	26.84	7.62	22.65	9.03	14.55	9.22
Percent recent immigrants	14.46	5.02	11.87	5.86	7.79	5.94
Crime rate	24.28	14.33	24.68	15.74	22.19	15.88
Indicators and controls						
Treatment school (1 = treatment, 0 = control	0.70	0.46	0.73	0.44	0.73	0.44
Male (1 = male, 0 = female)	0.50	0.50	0.51	0.50	0.54	0.50
Usual grades (1 = mostly Fs, 9 = mostly A’s)	6.51	1.78	6.41	1.91	7.22	1.77
Free or reduced lunch (1 = yes, 0 = no)	0.94	0.24	0.81	0.39	0.44	0.50
N	1989		1061		545	

Table 2

Effects of treatment on days drank alcohol past month (follow-up) across high and lowlevels of neighborhood characteristics among less linguistically acculturated Latino students

	1	2	3	4	5	6	7	8
	Single mother families		**Recent immigrants**		**Crime rate**		**Poverty**	
	Low	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**
Treatment school (1 = treatment, 0 = control)	−.11* (−3.75)	.00 (.07)	.00 (.00)	−.13* (−4.10)	.00 (−07)	−.10* (−3.09)	−.08* (−1.96)	−.05 (−.95)
Days drank alcohol past month, pre-test	.39* (11.54)	.39* (10.09)	.40* (11.99)	.38* (9.79)	.40* (11.46)	.39* (10.58)	.41* (11.12)	.37* (9.83)
Controls								
Male (1 = male, 0 = female)	.02 (.66)	.03 (.69)	.03 (.98)	.01 (.37)	.01 (.30)	.03 (.95)	.01 (.39)	.03 (.82)
Usual grades (1 = mostly F's, 9 = mostly A's)	−.02* (−2.27)	−.01 (−1.32)	−.02 (−1.67)	−.02 (−1.94)	−.02* (−2.30)	−.01 (−1.26)	−.01 (−1.44)	−.02* (−2.05)
Free or reduced lunch (1= yes, 0 = no)	.00 (.07)	.03 (.42)	.08 (1.21)	−.06 (−.76)	.07 (1.15)	−.03 (−.50)	.05 (1.02)	−.09 (−.81)
Intercept	.40* (4.92)	.23 (1.77)	.21 (1.83)	.47* (4.98)	.25* (2.29)	.38* (4.15)	29* (2.91)	.42* (3.35)

Notes. Coefficients are regression estimates from random intercepts models, with significance statistics in parentheses.

* $p < .05$, two-tailed tests.

Table 3

Effects of treatment on days drank alcohol past month (follow-up) across high and low levels of neighborhood characteristics among more linguistically acculturated Latino students

	1	2	3	4	5	6	7	8
	Single mother families		**Recent immigrants**		**Crime rate**		**Poverty**	
	Low	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**
Treatment school (1 = treatment, 0 = control)	−.05 (−.92)	−.12 (−.98)	−.07 (−1.09)	−.05 (−.50)	−.06 (−.67)	−.05 (−.72)	−.08 (−1.65)	.00 (−.02)
Days drank alcohol past month, pre-test	.46* (10.89)	.37* (6.35)	.40* (9.18)	.45* (6.01)	.40* (8.40)	.45* (8.64)	.40* (10.46)	.45* (6.81)
Controls								
Male (1 = male, 0 = female)	.04 (1.06)	−.02 (−.31)	.01 (.13)	.05 (.82)	.00 (−.09)	.05 (.93)	−.01 (−.33)	.08 (1.42)
Usual grades (1 = mostly F's, 9 = mostly A's)	−.01 (−1.13)	−.02 (−1.33)	−.03 (−1.94)	−.01 (−.55)	−.02 (−1.36)	−.01 (−.91)	−.02 (−1.34)	−.01 (−.88)
Free or reduced lunch (1 = yes, 0 = no)	−.03 (−.44)	−.09 (−1.11)	−.03 (−.66)	−.18 (−1.49)	−.05 (−.79)	−.04 (−.54)	−.05 (−1.07)	−.19 (−1.09)
Intercept	.39* (3.23)	.57* (3.23)	.47* (4.00)	.54* (3.06)	.47* (3.03)	.41* (3.01)	.45* (4.14)	.55* (2.25)

Notes. Coefficients are regression estimates from random intercepts models, with significance statistics in parentheses. Results are from a multiple imputation of 10 datasets.

* $p < .05$, two-tailed tests.

Table 4

Effects of treatment on days drank alcohol past month (follow-up) across high and low levels of neighborhood characteristics among white students

	1	2	3	4	5	6	7	8
	Single mother families		**Recent immigrants**		**Crime rate**		**Poverty**	
	Low	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**
Treatment school (1 = treatment, 0 = control)	−.02 (−.13)	−.09 (−1.38)	.05 (.44)	−.10 (−.71)	.10 (.57)	.05 (.35)	.00 (.00)	−.05 (−.24)
Days drank alcohol past month, pre-test	.33* (5.03)	.27* (3.37)	.33* (5.74)	.30* (2.18)	.27* (4.09)	.38* (4.51)	.33* (5.96)	.29 (1.35)
Controls								
Male (1 = male, 0 = female)	.00 (−.05)	.08 (1.50)	.02 (.59)	.02 (.16)	.04 (.86)	−.01 (−.19)	.03 (.60)	.00 (−.02)
Usual grades (1 = mostly F's, 9 = mostly A's)	−.04* (−2.10)	−.05* (−3.03)	−.03* (−2.32)	−.06* (−1.96)	−.03* (−2.11)	−.04* (−2.11)	−.04* (−2.51)	−.05 (−1.45)
Free or reduced lunch (1 = yes, 0 = no)	−.08 (−1.30)	.14* (2.35)	.00 (−.02)	−.04 (−.32)	.02 (.29)	−.02 (−.22)	−.01 (−.14)	.05 (.24)
Intercept	.58* (3.54)	.43* (3.29)	.36* (2.54)	.73* (3.17)	.26 (1.26)	.56* (3.44)	.44* (3.29)	.56 (1.67)

Notes. Coefficients are regression estimates from random intercepts models, with significance statistics in parentheses. Results are from a multiple imputation of 10 datasets.

* $p < .05$, two-tailed tests.