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Neighborhood Effects on HIV Testing: A Multi-Level Analysis

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Abstract

Objectives: Only one study has explored geographic variations in HIV-testing and one possible regional characteristic correlated with that variation, leaving many potential regional characteristics unexamined. This paper explores geographic disparities in HIV-testing and eleven neighborhood characteristics as potential correlates of those disparities, controlling for individuals' characteristics.

Methods: We used a 1999 random probability sample of Los Angeles (L.A.) County adults (n=5,267) to conduct a multi-level analysis of HIV-testing among respondents in: 1) all neighborhoods and 2) the subset of regions having more respondents reporting higher-risk sex. The latter was examined because, given limited resources, it is important to focus HIV prevention efforts where they could have the greatest impact – where concentrations of residents at higher-risk for HIV live.

Results: HIV-testing rates varied widely across all neighborhoods and slightly among higher-risk regions. Throughout L.A. and higher-risk regions, residents of African American neighborhoods were more likely to test than residents of White or Latino areas, regardless of individuals' characteristics or neighborhoods' number of AIDS cases and testing sites. Residents of mostly unmarried neighborhoods also were more likely to test.

Conclusions: Additional testing outreach efforts are needed in Latino and White higher-risk areas in L.A. County. Latinos represent 40% of the newly diagnosed AIDS cases in L.A.; similar rates are seen in the ten West and Northeast states where Latinos with HIV/AIDS are clustered. Thus, public health officials and HIV/AIDS service organizations among these regions may want to evaluate their efforts targeting Latino neighborhoods.

Introduction

An estimated 40,000 persons become infected with HIV nationally in the U.S. annually and recent reports show HIV rates are increasing.[1,2] However, many with HIV do not test and are unaware of their statuses.[3] To understand HIV-testing impediments, most studies focus on individuals' characteristics, ignoring characteristics of individuals' residential areas. Three studies have examined variations in HIV-testing across geographic regions and only one explored a possible regional characteristic associated with that variance, leaving many compelling regional characteristics unexamined.[4,5,6] HIV-testing has been associated with having a test site conveniently nearby or residing in areas with more AIDS cases.[4,7] None of the studies examined areas with concentrations of residents having "higher risk" behaviors. This study examined the variation in HIV-testing across all Los Angeles (L.A.) County neighborhoods and "higher-risk" regions. It examined eleven neighborhood characteristics as potential correlates of that variation, controlling for individuals' characteristics.

This paper builds on an earlier bivariate analysis of a 1997 sample of Los Angeles (L.A.) County residents showing variations in HIV-testing across eight health service areas, without exploring reasons for that variation or adjusting for individuals' characteristics.[3] This paper presents results from a multi-level analysis using a 1999 random sample of persons in L.A. County - a widely diverse area whose metropolitan area had the third largest number of AIDS cases nationally in 2001.[8]

We addressed two questions, "Were residents of some neighborhoods more likely to test for HIV in the previous two years than residents elsewhere?" and "What neighborhood characteristics were associated with the geographic variation in testing, controlling for individuals' characteristics?". We addressed these questions in two samples: 1) respondents in all L.A. County neighborhoods, enabling examination of individuals' testing across the full range of areas and 2) the subset of respondents in regions having larger percentages of respondents reporting higher-risk sex behaviors. We examined the latter sample because, given limited resources, it is important to focus HIV prevention efforts where they could have the greatest impact – where concentrations of residents at higher-risk for HIV live.

We focused on how neighborhood characteristics relate to individuals' HIV-testing because testing is a function both of individuals' behaviors and their residential contexts. There are at least two ways to conceive of neighborhoods' influence on testing. First, neighborhoods may offer residents more opportunities for sex with higher-risk partners if they have more: unmarried residents, persons having higher-risk sex, or persons with HIV/AIDS, (including gay males or Latinos and African Americans because they disproportionately are affected by HIV/AIDS).[8] Individuals acting on those opportunities may perceive themselves at higher-risk for HIV and, subsequently, may be more likely to test. Neighborhoods also could represent structural-level phenomena affecting testing. For example, a neighborhood's supply of testing sites could affect testing because the demand for preventive health care, which is more responsive to price than other types of health care, may depend on travel as well as financial costs.[9] Predominately Latino or African American neighborhoods or areas with higher HIV/AIDS prevalence could be proxies for increased outreach efforts by HIV prevention organizations. They also could represent increased awareness about HIV/AIDS. Given this, we hypothesized three neighborhood characteristics would explain most of the geographic variation in individuals' testing, neighborhoods': cumulative number of AIDS cases, publicly-funded HIV- testing site supply, and racial/ethnic composition.

This paper is important for understanding HIV-testing decisions because it documents the role of both neighborhoods' characteristics and individuals' risk and demographic factors. It does so in both the entire sample of L.A. neighborhoods and higher-risk regions. Identifying neighborhood-level correlates of low testing rates, particularly in higher-risk neighborhoods, is potentially important to public health agencies nationally. They can use these insights to increase their outreach efforts in areas where many higher-risk people in need of testing reside.

Methods

Sample

The L.A. County Health Survey (LACHS) was a population-based telephone survey administered in 1999 and 2000 to L.A. County residents ages 18 and older. Of those contacted by random digit dialing, 8,354 completed the survey, producing a 55% response rate. The survey was given in English, Spanish, Cantonese, Mandarin, Korean, and Vietnamese. Additional details of the survey are found elsewhere.[10] The sample used in this analysis included only persons responding to the survey item asking if they had tested for HIV or AIDS in the past two years (persons ages 65 and older were not asked this question (n=1041) and 120 reported to not know or did not respond). Persons having little choice in whether or not they tested were excluded from the analysis because this paper focuses on how contextual factors might affect individuals' decisions to test for HIV. Persons excluded were those testing because of a job or an insurance requirement (n=294) or they were donating blood (n=221) or receiving prenatal care (n=452). (Women receiving prenatal care are routinely offered HIV-testing and many choose to test.)

We operationalized "neighborhood" as the ZIP code. ZIP codes may not represent cohesive, homogenous neighborhoods but using them allowed us to conduct a multi-level analysis because most ZIP codes contained a sufficient number of respondents.[22] Using a smaller geographic region such as census tracts would have prevented us from obtaining stable, accurate estimates of the indicators that suggest the intercept or slopes vary. Thus, the sample excluded persons not providing ZIP codes or cross streets from which ZIP codes could be derived (n=751). It also excluded those in ZIP codes containing fewer than eight survey respondents because of the aforementioned multi-level modeling requirements (n=208). (Eight is a somewhat arbitrary cut-off. Some less conservative multi-level analyses have fewer respondents per group.) The final sample contained 5,267 persons nested in 233 ZIP codes.

From this sample, we also derived a higher-risk subset - persons in neighborhoods with higher proportions of respondents reporting higher-risk sex behaviors. Higher-risk sex behaviors are defined as in the past year, not always using condoms and having more than one sex partner. To obtain this higher-risk subset, we merged smaller, contiguous neighborhoods to create larger regions having at least 30 respondents. Using these larger regions reduced the standard errors of proportions of respondents reporting higher-risk sex behaviors. The central limit theorem was used as a rough guide in selecting n=30 as the minimum number of respondents for a region, even though we are estimating a binomial distribution. Of 233 neighborhoods, we merged 190 neighborhoods that were similar on the two characteristics determined to be most related to the geographic variation in testing, producing 80 larger regions. Forty-three neighborhoods already contained 30 or more respondents and were left un-merged, resulting in 123 regions total. Regions' characteristics were derived by taking the weighted average of the neighborhoods comprising them. Using this "region" data, we created the "higher-risk" subset for analysis by selecting regions having proportions of residents reporting higher-risk sex that were one standard deviation (0.080) above the mean (0.138), (n_{region}=20, $n_{respondent}$=928).

<u>Variables</u>

The dependent variable was whether or not individuals tested for HIV in the past two years. We examined eleven contextual (neighborhood- or region-level) and twelve individual-level factors (see Table 1). Neighborhood characteristics were at either the ZIP code- or ZIP Census Tract Area (ZCTA)-level. ZCTAs are geographic areas used by the census approximating postal ZIP codes. The three main explanatory neighborhood-level variables of interest were the cumulative number of AIDS cases in 1999, the number of HIV test sites, and racial/ethnic composition. Their sources are noted in Table 1**.** Regarding test sites, we focus on publicly-funded sites, including community, non-profit, and family planning clinics. (The latter account for 17% of L.A. County women's HIV tests in the previous two years.)[3] Although hospitals and private medical offices offer HIV-testing, their geographic location should have little impact on decisions to test due to their relative ubiquity. Seven additional neighborhood-level variables were obtained from the 2000 Census including: higher-risk sex indicators such as 1) percentage of single adults and 2) male same-sex partner households; 3) median household income, 4) education and 5) unemployment rate; 6) residential stability (being in the same household as five years prior) representing social networks; 7) percentage of non-English speakers representing language barriers to care, and 8) the proportion of respondents having higher-risk sex behaviors. The latter was a region-level variable obtained from aggregating individuals' responses in each region. As noted above, region-level aggregates should produce more reliable estimates than neighborhood-level aggregates for neighborhoods with less than thirty respondents.

Analysis

A descriptive univariate analysis of persons in the sample was conducted using Stata.[12] We then built a series of hierarchical models on which we conducted multi-level logistic regression analysis using MLwiN to estimate geographic variation in individuals' likelihood of testing for HIV, controlling for individual-level factors.[13] Multi-level analysis is useful when individuals are nested within larger groups, such as neighborhoods, because it adjusts standard errors to account for the lack of independence among persons in the same neighborhood. (There is a lack of independence because persons living in the same neighborhood may be similar in unobserved ways.) We used this technique to estimate neighborhood-specific regression intercepts and slopes. Individual-level variables were entered as deviations from the neighborhood mean, so intercepts were interpreted as the mean testing probability within a neighborhood. We tested whether intercepts and slopes varied across neighborhoods and, if so, the neighborhood characteristics associated with that variation.

The first model included no covariates and was simply used to detect geographic variation in HIV-testing across neighborhoods ("random intercept" model). The second model added twelve individual-level covariates. Any slope varying across neighborhoods was modeled as such ("random slopes model"). The third model added the three neighborhood-level factors hypothesized to be related to the geographic variation in HIV-testing: the number of test sites, the number of AIDS cases and the racial/ethnic composition. The final model added the eight remaining neighborhoods factors, one at a time. Neighborhood-level variables were grand mean centered, so the overall intercept can be interpreted as the mean testing probability for the average neighborhood. Empirical Bayes estimates were produced for neighborhoods' varying intercepts and slopes to adjust for the differential number of respondents per neighborhood.

Finally, we compared testing probabilities for the average resident of "predominately" African Americans neighborhoods with probabilities for residents of areas comprised predominately of persons who were ethnically/racially similar to themselves. "Predominately" was defined as one standard deviation above the mean percentage. However, few Asians lived in predominately African Americans neighborhoods. In this case only, we defined "predominately" as any percentage above the mean.

These steps were first conducted among the entire sample ($n_{neighborhood}$=233, $n_{respondent}$=5,267) and then replicated on the region data set (n_{region}=123, $n_{respondent}$=5,267) adding the final contextual variable of interest – region-level proportion of higher-risk residents. Finally, we repeated the entire analysis using the higher-risk subset (n_{region}=20, $n_{respondent}$=928).

Full iterative generalized least-squares methods were used for the full sample and residual (or restricted) methods were used for the higher-risk subset, which is appropriate when fewer clusters (cities, here) are present.[14] Second-order penalized or predictive quasi-likelihood (PQL) methods were used for all estimations.[15] T-tests estimated the significance of individual- and neighborhood-level covariates. For covariates comprised of several terms, Wald statistics having chi-square distributions were used as global tests of significance. They also estimated the significance of the variance components (the amount of variation in testing or slopes across neighborhoods) and are considered better approximations of model fit than log likelihood (deviance) statistics in non-normal, multi-level models.[16] We also explored potential model misspecification and found no evidence of it. Sampling weights were included in all analyses to adjust for differential rates of survey participation. The weights were designed using selected demographic variables in the 1998 Los Angeles County population census projections.

Results

Descriptive statistics are presented in Table 1 for the unweighted and weighted individual- and neighborhood-level variables. We also compared the analysis sample's weighted statistics to those of the entire sample completing the survey, or the L.A. County population (results not shown). As expected, the analysis sample was slightly younger than the entire sample.

Results of examining the variation in mean probabilities of HIV testing across 233 neighborhoods (model 1) are presented in the form of a L.A. County map. Figure 1 shows that neighborhoods varied greatly in their residents' mean probabilities of testing in the previous two years, using a model containing no covariates. While 27% of L.A. residents tested, this percentage ranged from 15% to 48% across neighborhoods (neighborhood-level variance component=0.205; standard error=0.041; chi-square=24.727, 1 d.f., $p<0.0001$).

Table 2 presents the results of introducing potential neighborhood-level correlates of the geographic variation in testing probabilities, controlling for individual-level factors. The first column shows the resulting neighborhood-level variance components and intercept for a model including only individual-level variables. The intercept's variance component suggests that the testing probability varied across neighborhoods. However, no slopes (individual-level variables) varied across neighborhoods. The second column reports the effects of adding the three main neighborhood-level characteristics to the model to determine if they correlate with the intercept's variation. It suggests that, regardless of one's own characteristics, living in neighborhoods having more AIDS cases or areas having higher percentages of African Americans increased one's likelihood to test for HIV while the number of test sites did not.

Results from analyzing the final model are shown in the third column of Table 2. This model included the only other neighborhood characteristic related to testing, the percentage of unmarried residents. Persons in neighborhoods having higher percentages of unmarried or African American (versus White) residents, regardless of their own marital status or race/ethnicity, were more likely to test than residents elsewhere**.** (In a second analysis using neighborhood percentage of Latino residents as the reference group, residents of African American neighborhoods were more likely to test (odds ratio=1.2, 95% confidence interval=1.1, 1.3) while residents of White areas were as likely to test (odds ratio=1.0, 95% confidence interval=0.9, 1.0). Neighborhoods' number of AIDS cases no longer was related to testing in the final model.

Using this final model, we also compared testing probabilities for the average resident of "predominately" African Americans neighborhoods with residents of areas comprised predominately of persons who were ethnically/racially similar to themselves. The testing probabilities were: Latinos, 56% versus 27%; Asians, 24% versus 8%; and Whites, 47% versus 27%. Likewise, African American residents of predominately African American neighborhoods had a 65% probability of testing compared to African American residents of predominately White or Latino neighborhoods who had testing probabilities of 41% and 40%, respectively. Likewise, unmarried residents of predominately unmarried neighborhoods had a 51% probability of testing while unmarried persons living elsewhere had a 23% testing probability.

Regardless of individuals' characteristics, higher-risk regions did not have uniformly higher HIV-testing rates, and vice versa. Examples of this are given in Table 3. The first three regions shown are where fewer respondents tested relative to those reporting risky sex behaviors. Analyzing only the higher-risk regions, residents had a 31% probability of testing during the prior two years. This probability slightly, but non-significantly, varied across regions (neighborhood-level variance component=0.148, s.e.=0.088). As in the entire L.A. sample, neighborhoods' ethnic/racial compositions were related to testing in higher-risk regions in a model containing the number of AIDS cases and test sites, and individual-level variables. Persons in regions having higher percentages of African Americans were more likely to test (odds ratio=1.3, 95% confidence interval=1.1-1.6) than residents of White neighborhoods and, when using percentage of Latinos in neighborhoods as the reference group, more likely to test than Latinos (odds ratio=1.2, 95% confidence interval=1.1-1.5). Neighborhoods' percentages of unmarried persons were unrelated to testing variation.

Discussion

L.A. County residents' mean probability of voluntary HIV-testing in the previous two years was 27%, in concordance with national studies.[17] However, this probability varied across neighborhoods. Among higher-risk regions, testing rates appeared higher (31%).

Neighborhood-level correlates of HIV-testing included neighborhoods' racial/ethnic composition and percentage married. For both the entire sample of L.A. neighborhoods and higher-risk regions, residents of predominately African Americans neighborhoods were more likely to test than residents of White or Latino neighborhoods, regardless of their own race/ethnicity or any of eleven other characteristics. Possible explanations for this stem from the fact that HIV/AIDS disproportionately affects African Americans.[11] First, HIV prevention outreach efforts may be targeting African American neighborhoods more than others. Also, residents of these neighborhoods might be relatively more aware of HIV/AIDS because of increased knowledge of local acquaintances who are infected, and this awareness may lead to testing. Residents of these neighborhoods may perceive themselves to be at increased risk for HIV due to the greater likelihood of encountering HIV-positive sex partners, and subsequently may test. Residents of predominately single neighborhoods also were more likely to test than residents of married neighborhoods, regardless of their own marital statuses. They may perceive themselves at higher risk for HIV due to more opportunities to meet new sex partners (bars and clubs) relative to areas where married residents predominate.

Among all L.A. neighborhoods and higher-risk neighborhoods, residents of areas having more Latinos were less likely to test than African American areas but not more likely to test than residents of White areas. This is a concern because Latinos accounted for 45% of the county's newly diagnosed AIDS cases in 2002.[11] The relatively stronger HIV/AIDS stigma among Latinos may partially explain this.[18] Alternatively, a false sense of security regarding HIV may prevail among residents of White and Latino higher-risk neighborhoods, with residents thinking that HIV does not exist in their social group. This finding also could reflect greater difficulty accessing testing in Latino neighborhoods due to language barriers, lack of insurance or greater reliance on non-traditional providers who do not offer testing.

Counter to our hypotheses, HIV-testing was unrelated to neighborhoods' number of AIDS cases and publicly-funded HIV test sites when neighborhoods' racial/ethnic composition and percentage unmarried was controlled for. Historically, the majority of AIDS cases in L.A. have occurred among gay or bisexual men.[11] Thus, the majority of L.A. residents, even if they practice unsafe sex, may not feel themselves at risk from a disease they perceive to be a "gay disease". The number of HIV cases due to heterosexual transmission might have more relevance to testing among L.A. residents. The publicly-funded test site supply may be unrelated to testing because half of L.A. County residents who test for HIV do so at private physicians' offices.[5]

However, testing technologies and California HIV-testing policies have changed since 1999, possibly making non-medical test sites more important today. State-funded test sites are now paid per test given, possibly inducing increased outreach activities. Almost all offer oral tests, which many persons prefer to blood tests, and the recently approved "rapid" tests should have widespread availability soon. The uptake of these technologies at medical settings remains unclear.

This study has some limitations. The results' generalizability to sparsely populated areas of L.A. County may be hampered because we deleted neighborhoods containing few respondents from the analysis. We also removed from the analysis the small percentage of persons not providing geographic identifiers. Survey weights accounted for the likely under-representation of homeless persons or those without telephones in this telephone-administered survey. Unique features of L.A., such as the concentration of AIDS cases among gay or bisexual men, also may limit the generalizability to other U.S. neighborhoods. Although the survey's response rate was somewhat lower than that in national health studies, sample averages for key variables are similar to those found elsewhere.[10] The "higher-risk" definition may be rather crude and understate risk due to respondents' unwillingness to report risk-taking behaviors. Alternatively, our measure may over-state risk because it does not allow for strategic use of condoms by persons with multiple partners. Nonetheless, individuals' higher-risk behaviors predicted HIV-testing in this study, providing support for the validity of the measure. Further, the measure included only sexual behaviors because we lacked illicit drug use data. This might be a minor issue because injection drug use is the sole exposure risk for only 10% of L.A. County's AIDS cases.[11]

This research also has the strength of going beyond analyzing individuals' characteristics to also examine neighborhood-level correlates of HIV-testing. It identified neighborhood characteristics related to testing, among all and higher-risk neighborhoods. Our results suggest that even among areas with greater prevalence of higher-risk behaviors, HIV-testing rates are relatively low in White and Latino neighborhoods. Public health officials in L.A. and elsewhere can use this information to re-examine their current efforts in White and Latino higher-risk neighborhoods. This analysis suggests that simply increasing the number of HIV-testing sites will not, by itself, be sufficient. The "build it and they will come" adage appears to not apply to HIV-testing sites. Rather, public health officials might want to examine the testing messages and outreach efforts occurring in African American neighborhoods for guidance on possible interventions to increase testing elsewhere. Additional research, perhaps qualitative, also might address this issue. The potential mechanisms leading to increased testing might involve social marketing efforts, social networks, or other factors such as routine HIV-testing practices, as was recently advocated by the CDC.[19]

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Human Subject Protection

This study was approved by the University of California Los Angeles committee on human research.

Table 1. Description of weighted and unweighted sample (n=5,267)

Variable	Weighted mean or %	Unweighted mean or %
Individual-level		
Marital status		
Unmarried, not living together	49	46
Unmarried, living together	8	8
Married	43	46
Female	47	56
Age	39	38
College educated	25	28
Race/ethnicity		
Latino	32	33
African American	10	10
Asian/Pacific Is	12	9
Other	4	4
Non-English speaker (a)	28	26
Household income	41,301	43,398
Having a regular source of medical care	74	76
Insurance status		
Private	61	63
Public	6	6
None	33	31
Employed	72	71
Having "risky" sexual behaviors (b)	13	11
Neighborhood-level		
# Cumulative 1999 AIDS cases (c)	203	199
# Publicly-funded test sites (d)	0.88	0.87
Race/ethnicity (e)		
Latino	44	43
African American	9	10
Asian-Pacific Islander	12	12
Other	3	3
% Unmarried (f)	57	56
% College educated	23	23
% Non-English speaking	17	16
Mean household income	42,927	43,786
Unemployment rate (g)	5.1	5.1
Residential stability (h)	49	48
Male same-sex partner households	74	73

(a) Non-English speakers = those completing surveys in languages other than English
(b) Risky sex = 1) last year, not always wearing condoms and having >1 partner or 2) being a gay or bisexual male
(c) Obtained from the LA County Office of AIDS Programs and Policy [27]
(d) Obtained from LA County Dept. of Health Services [28], AIDS Project LA [29], and the Los Angeles Regional Family Planning Council, Inc.[30]
(e) Data for this and the following 7 variables were obtained from the 2000 Census
(f) % Unmarried = among those age 15+
(g) Unemployment rate = among those age 16+ in the labor force
(h) Residential stability= % of persons age 5+ who no longer live at their residence of 5 years prior

Table 2. Results of multi-level, multivariate logistic regression analysis of individuals' mean likelihoods of testing for HIV in the previous two years in L.A. County, (n=5,267)

	Model 2: 12 individual-level factors only (1)		Model 3: Added 3 neighborhood-level factors			Model 4: Added 4 other neighborhood-level factors		
	Coeff.		Coeff.	OR (95% CI)	Test	Coeff.	OR (95% CI)	Test
Intercept	-1.113		-1.090			-1.100		
Neighborhood-level variables (3):								
# Cum. AIDS cases (4)			0.533	1.7 (1.3, 2.3)	t=3.6**	0.070	1.1 (0.8, 1.5)	t=0.4
# HIV test sites			0.002	1.0 (0.9, 1.1)	t=0.1	-0.022	1.0 (0.9, 1.1)	t=0.6
Race/ethnicity (4)				X^2=43.810, 4df ***			X^2=18.222, 4df**	
% White				1.0			1.0	
% African American			0.185	1.2 (1.1, 1.3) *	t=6.2***	0.122	1.1 (1.1, 1.2) *	t=3.9***
% Latino			0.039	1.0 (1.0, 1.1)	t=1.6	0.009	1.0 (1.0, 1.1)	t=0.4
% Asian/Pacific Is.			-0.016	1.0 (0.9, 1.0)	t=0.4	-0.010	1.0 (0.9, 1.1)	t=0.3
% Other			0.348	1.4 (1.0, 2.0)	t=1.1	0.208	1.2 (0.7, 2.2)	t=0.7
% Unmarried (4)						0.334	1.4 (1.2, 1.6)	t=5.2***

Variance components:	Coeff. (95% CI)	Chi-Square	Coeff. (95% CI)	Chi-Square	Coeff. (95% CI)	Chi-Square
Intercept	0.232 (0.157, 0.307)	25.694, 1df ***	0.122 (0.053, 0.191)	12.468, 1df **	0.083 (0.024, 0.142)	7.593, 1df *

1) 12 individual-level factors were included in all models. In the final model, their ORs were: age (0.7)***, race/ethnicity*= African American (1.8)***, Latino (1.4)*, Asian/Pacific Islander (0.5)***, other race/ethnicity (1.9)*; employed (0.8) *; female (1.0); annual household income (1.0); household size (0.9)***; insurance status* = uninsured (0.8)*, publicly insured (1.2); marital status*** = single (1.6)***, living together (1.2)***; non-English speaker (1.0); regular source of medical care (1.5)**; risky sex behaviors (2.1)***; and college educated (0.9).
2) Global chi-square tests were used for variables comprised of several terms and t-tests were used for individual terms.
3) Statistics represent those for the average person in the average LA County neighborhood because individual-level variables were centered within neighborhoods and neighborhood-level variables were grand mean centered.
4) This continuous variable is presented in terms of 10s (10 AIDS cases or 10 percentage points). Thus the AIDS cases' OR of 1.7 can be interpreted as, for every increase of 10 AIDS cases in the average neighborhood, the odds of residents' testing increase by 70%.
5) Coeff.= coefficient, OR= odds ratio, CI= confidence interval, SE= standard error, df= degrees of freedom
* =p<0.05, ** =p<0.001, *** =p<0.0001

Table 3. The mismatch between testing rates and percentages of respondents reporting higher-risk behaviors in select regions.

Higher-risk[1]/lower-test regions	% of respondents w/higher-risk[2] sex behaviors	% of respondents testing for HIV
1. An urban region containing the area where many gay males reside, mostly White and single, median hh[3] income, (n=58)	48	37
2. An East L.A. area comprised mostly of Latinos with some Asians, % married is average, below median hh income, (n=30)	35	28
3. A suburban area comprised of equal parts of Whites and Latinos with some Asians, % married is above average, median hh income, (n=34)	26	19
Lower-risk/higher-test regions		
1. A South Central region comprised mostly of African Americans with some Latinos, mostly single, below median hh income, (n=59)	3	43
2. A South Central region comprised mostly of African Americans and Latinos, mostly single, below median hh income, (n=51)	4	29
3. A downtown region comprised of Latinos and Asians, % married is average, below median hh income, (n=56)	7	32

1. Higher-risk regions = regions having proportions of residents reporting higher-risk sex that were one standard deviation (0.080) above the mean (0.138), (n_{region}=20, $n_{respondent}$=928)
2. Higher-risk behaviors = a) in the past year, not always using condoms and having more than one sex partner or b) being a gay or bisexual male
3. HH=household

Figure 1. Probability of HIV Testing by Los Angeles Neighborhoods