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Nonresidential Crime Attractors and Generators Elevate Perceived Neighborhood Crime and Incivilities

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Recent studies have produced conflicting findings about the impacts of local nonresidential land uses on perceived incivilities. This study advances work in this area by developing a land-use perspective theoretically grounded in Brantingham and Brantingham's geometry of crime model in environmental criminology. That focus directs attention to specific classes of land uses and suggests relevance of land uses beyond and within respondents' neighborhoods. Extrapolating from victimization and reactions to crime, crime-generating and crime-attracting land uses are expected to increase perceived neighborhood incivilities and crime. Multilevel models using land use, crime, census, and survey data from 342 Philadelphia heads of households confirmed expected individual-level impacts. These persisted even after controlling for resident demographics and for neighborhood fabric and violent crime rates. Neighborhood status and crime were the only relevant ecological predictors, and their impacts are interpreted in light of competing perspectives on the origins of incivilities.

Keywords: *fear; disorder; land use*

Variations in land use, like variations in housing type, are part of the fundamental fabric of neighborhoods (Brower 1996). They shape the quality of life for residents and contribute to local reputations, house market values (Miller 1981), and, of course, local crime rates (Taylor and Gottfredson 1986). In the case of sizable and noxious land uses such as landfills or toxic sites, impacts on quality of life and psychological outcomes may extend well beyond a neighborhood's boundary (Bullard 1994; Edelstein 1988).

The current work sought to gauge the connections between nonresidential land uses and two crime-related judgments about neighborhoods: perceived incivilities and perceived crime. Perceived incivilities, extensively investigated during the past 20 years (Harcourt 2001; Skogan 1990; Taylor 2001; Wilson 1975; Wilson and Kelling 1982) capture residents' estimates of social and physical disorder in their neighborhood. Typical survey items ask residents about the severity of problems such as vandalism, graffiti, vacant houses, vacant lots, housing in poor repair, closed-up store fronts, abandoned vehicles, unsupervised groups of teens, neighbors fighting, and so on.

The determinants of perceived incivilities include both neighborhood factors and individual differences. Studies typically find more extensive perceived incivilities in lower status, more predominantly African American, less stable, and higher crime neighborhoods (Taylor 2001:136-41). Determinants of changes in perceived incivilities are somewhat similar (Robinson et al. 2003; Taylor 2001:169-72). Some works find that individual differences in race and status also influence extent of perceived local problems (e.g., Lewis and Maxfield 1980; Sampson and Raudenbush 2004; Skogan and Maxfield 1981); usually lower status, non-White residents report more problems, but not always. Results may vary somewhat depending on whether total (social and physical) or social or physical incivilities are the focus. Furthermore, determinants of perceived incivilities may differ from those of assessed incivilities (Taylor 1999).

Prevalence of nonresidential land use links to street block variations in assessed incivilities. Structural equation models of street blocks in two major cities found more extensive physical deterioration, in the form of litter, vandalism, dilapidated properties, and abandoned properties, on street blocks with more extensive nonresidential land use (Taylor et al. 1995).

Land-use mix also shapes residential dynamics. A study in one large, urban neighborhood found residents on street blocks with more nonresidential land uses less involved in managing immediate outdoor locations (Kurtz,

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Koons, and Taylor 1998). Some types of residential land uses increased calls to police for disturbances on the block, even after controlling for residents' involvement. Contrasting this result, however, a Chicago study of census tracts found no impacts of a mixed land use–assessed incivilities instrument on collective efficacy (Sampson and Raudenbush 1999, note 14).

Given the land use–assessed incivilities connection at the street-block level, it makes sense to expect that those living closer to a greater number of nonresidential land uses would report more perceived neighborhood incivilities. Work to date, however, has proven inconsistent.

One census tract–level analysis in Seattle supported the expectation. In tracts where residents reported more nearby business places, they also perceived more physical incivilities, even after controlling for neighborhood demographic structure and local social dynamics (Wilcox et al. 2004). The authors suggested that "the stranger-dominated traffic associated with business places . . . [increased] physical deterioration" (p. 197). The findings and identified processes align with earlier-documented street block–level connections (Kurtz et al. 1998; Taylor et al. 1995) and suggest homologous dynamics at a higher spatial unit, the neighborhood.

By contrast, Sampson and Raudenbush (2004) failed to find a connection among a general nonresidential land-use indicator, proportion of blocks with mixed land use, and perceived incivilities in a study of Chicago census block groups.[1] In another analysis, however, bars and liquor stores, signs of commercial building security, and presence of alcohol or tobacco advertising showed a combined influence on perceived incivilities (their Table 5), even after controlling for the local violent crime rate. The proportion of blocks with mixed land use remained uninfluential.

Two reasons might explain why land use failed to link to perceived incivilities in this last study. First, the initial major analysis (Sampson and Raudenbush 2004, Table 3) may have overcontrolled by partialling for assessed deterioration, thus eviscerating the impacts of mixed commercial land use.[2] Assessed physical and social incivilities may have been mediating the effects of both mixed land use and alcohol establishments, so the partialling rendered nonsignificant the impacts of both land-use variables.[3] Second, in their second major analysis, they did find effects of a factor that included specific crime-generating land uses—alcohol related—but their factor also included advertisements and commercial building security. Given that crime generators were only a small portion of this complex factor, such results cannot be interpreted as conclusively demonstrating an impact of crime-generating land uses on perceived incivilities.

In short, these two recent studies generated conflicting results. One suggested that nearby businesses influenced perceived incivilities at the neighborhood level, even after controlling for neighborhood structure (Wilcox et al. 2004). The other suggested mixed land uses failed to have an impact but also presented nonsignificant or difficult-to-interpret results for key crime-producing land uses such as alcohol establishments (Sampson and Raudenbush 2004).

The current article recasts this discussion by placing it within a behavioral geography framework. More specifically, it will direct attention to land uses specifically targeted by Brantingham and Brantingham's (1981) geometry of crime model in environmental criminological theory.

The behavioral geography perspective suggests that people, offenders, and nonoffenders alike move through an activity space in their daily lives (Rengert and Wasilchick 1985). They go to work, go home, go shopping, go bowling, visit friends, and so on. Regularly used paths connect them to different nodes of activity. Putting all these paths and nodes together generates an activity space for each individual. Furthermore, these movements generate for each individual not only an activity space but also an awareness space. Each person has an awareness of conditions and activities not only of those spaces through which he or she is moving but also of adjoining locations. These activity spaces and awareness spaces are overlaid on an environmental backcloth, a fabric of varying residential, nonresidential, and natural features through which individuals move.

Brantingham and Brantingham (1981) suggested that the intersection between the environmental backcloth and an individual's activity space creates variations in risks of criminal victimization. The connections between the local land-use patterns and the activity patterns are key, not just the land-use patterns on their own.

The notion here is that these land use–activity intersections do not generate just variations in risks for criminal victimization; they also contribute to residents' ideas about local crime and disorder levels. Residents make inferences and assumptions and gather information from others about the places through which they move and nearby locations. From these, they generate more general ideas about crime and disorder locally.

It was not feasible in the current study to get an exhaustive record of each resident's activity space. Nevertheless, it was feasible to adopt a simplifying assumption: The closer someone lived to crime-relevant land uses, the more likely his or her awareness space would be affected by those land uses and the activities and events surrounding them and, thus, the more crime and disorder he or she might report.

From a behavioral geography perspective, how much neighborhood boundaries matter to activity and awareness spaces hinges on a number of issues: extent of physical barriers to travel (Brantingham and Brantingham 1993) and stratification or racial discrepancies between adjoining residential groups, for example. Barring such physical or psychosocial impediments, however, residents move through many neighborhoods in their daily or weekly rounds of activity. Therefore, all criminogenic land uses in the region are potentially relevant to the resident, regardless of whether they are inside of or outside of his or her neighborhood boundary.

The environmental criminology perspective further assists in focusing an investigation on nonresidential land uses by suggesting two specific categories of relevant land uses: crime attractors and crime generators (Brantingham and Brantingham 1993; Rhodes and Conly 1981).

Crime generators are businesses, institutions, and facilities that bring large numbers of different kinds of people into a locale. Among those brought to the locale are some potential offenders and some potential victims. In this study, the three types of land uses classified as generators are high schools (Roncek and Faggiani 1985; Roncek and Lobosco 1983), subway stops (Block and Block 2000), and expressway off ramps (Eck and Weisburd 1995). The large volume using or passing through these locations generates not only many opportunities for crime but also physical and social incivilities. The former reflects the deterioration associated with the higher use pattern, and the latter may emerge from both the users themselves and the weakened resident-based informal surveillance linked to such "holes" in the residential fabric (Baum, Davis, and Aiello 1978; Taylor et al. 1995). Given the incivilities appearing, residents nearby should perceive more disorder. Given the increased crime and victimization opportunities, residents nearby should perceive more crime problems.

Crime attractors, like generators, draw in outside users. But given the purposes of these land uses and the composition of those drawn there for these purposes, a higher fraction of potential offenders or victims is likely with attractors.

Pawn brokers, check-cashing stores, drug-treatment centers, halfway houses, homeless shelters, beer establishments, and liquor clubs were grouped together as crime attractors here and were expected to generate localized crime and incivilities, which would then be perceived by residents. Criminals frequently use pawn brokers to exchange stolen goods for money. Those without checking accounts often use check-cashing stores as banks (Anderson 1999). Drug markets have been found to cluster around both of these land-use types because of the quick and easy cash they provide for drug transactions (Rengert, Ratcliffe, and Chakravorty 2005).

Drug-treatment centers, halfway houses, and homeless shelters are facilities specifically designed for borderline populations that suffer from high criminality and drug usage and have been shown to attract drug markets (Rengert et al. 2005). Thus, their presence in an area is theorized to increase area crime and disorder rates.

Retail alcohol sales available in beer establishments and liquor clubs (see definitions below) may increase not only assaults and other crimes as in other studies (Frisbie 1978; Gorman, Speer, and Gruenwald 2001; Peterson, Krivo, and Harris 2000) but fights and rowdy behaviors as well. Drug dealers and prostitutes may be attracted to ply their trades. Given those drawn to these locations, and the associated activities, with generators, as with attractors, resident-based informal control and surveillance also may be weakened, further contributing to the opportunities for victimization. Consequently, given the use patterns, residents closer to more generators should perceive more incivilities and crime.

These two classes of uses are separated given their differing roles in pattern theory. Those land uses in the generator category are simply expected to draw in smaller fractions of potential offenders and victims, relative to attractors, given the generator land uses' generally more numerous and more diverse user groups.[4]

In addition to investigating perceived incivilities, perceived neighborhood crime was included as a separate index. As explained above, these land uses may generate violent or drug crimes, and residents may be aware of this. No position is taken here on what the causal relationship might be between these two sets of cognitions. Net of local crime or victimization rates, one could argue that the first (perceived incivilities) feeds the second (perceived crime), or the reverse, or that the two simultaneously feed one another, or that their dynamics only partially overlap. Such questions about these two concepts, albeit most worthwhile, are not addressed here. What are addressed are the following. First, incivilities are not crimes (Rosenfeld 1994), even though some incivilities indices have included questions about misdemeanors (vandalism) or even felonies (drug sales). The two need to be separated. Second, there are ongoing discussions about the "meaning" of perceived incivilities (Harcourt 2001; Sampson and Raudenbush 2004). Whether predictors similarly influence these two outcomes or not has implications for those discussions. For example, if the determinants of perceived crime and perceived incivilities are closely comparable, this would support the view of incivilities (see below) suggesting that perceived incivilities should be treated as crime-related reports.

Of secondary interest but also theoretically relevant will be the pattern of neighborhood impacts on these outcomes after controlling compositional differences across neighborhoods (Sampson, Morenoff, and Gannon-Rowley 2002). The pattern will provide information relevant to three competing perspectives on the origins of incivilities (Taylor 2001:136-42). The structural perspective suggests that neighborhood status should have the strongest impact on incivilities; it determines what levels of service and enforcement a neighborhood receives. The historical-legal or essentialist (Sampson and Raudenbush 2004) view suggests that local crime rates, which amplify disorder and which disorder feeds (Kelling and Coles 1996), should have the most sizable impact. Finally, the racial perspective suggests that neighborhood racial composition should prove most influential because it is the strongest determinant of patterns of service delivery and enforcement according to this view. Which neighborhood factor most strongly influences incivilities will shed light on these three perspectives.

In sum, the current investigation examines how a resident's location with respect to criminogenic land uses specified by environmental criminology, relevant to his or her activity space within and beyond the neighborhood, influences the amount of crime and disorder he or she perceives in his or her neighborhood. Given conflicting earlier studies on land use and perceived incivilities, this influence deserves further attention. Work to date has linked these land uses to victimization (e.g., Rhodes and Conly 1981) but not to perceived incivilities and perceived crime. Of secondary interest is gauging the relative impacts of fundamental neighborhood fabric, and neighborhood crime, on these outcomes.

Method and Data

Data used in this research consisted of four types: surveys, mapped respondent and land-use street addresses, selected census data aggregated to the neighborhood level, and geocoded reported crime aggregated to the neighborhood level.

Survey Procedures and Weighting

Survey data come from the 2003 Philadelphia Area Survey (PAS) conducted by the Institute for Survey Research for Temple University and the William Penn Foundation (Institute for Survey Research 2003; N = 1,028). The PAS was a random-digit-dial household telephone survey conducted in the fall of 2003, encompassing the nine counties in the Philadelphia metropolitan area as defined for the 2000 U.S. census (Bucks, Chester, Delaware, Montgomery, and Philadelphia Counties in Pennsylvania and Burlington, Camden, Gloucester, and Salem Counties in New Jersey). Calls were made during weekdays, weekday evenings, and weekends. Most of the interviews were completed on or before six call attempts, but in a small number of cases, some completed interviews required more than 30 call attempts. This study relied on interviews (n = 342 unweighted) only from the city of Philadelphia.

Interviews included questions concerning neighborhoods, employment, community relations, public services, contacts respondents have had with police, and basic demographic information. Interviews took an average of 35 min to complete, and, on completion of the interview, respondents providing a name and mailing address were sent a $10 postal money order.

The response rate for the PAS depended on which definition of response rate was used.[5] A typically used response rate would consider completed interviews as a fraction of contacted households where eligibility was known. That was 76.5 percent.[6] Checks of unweighted survey marginals on key demographics against census data found relatively close matches.[7]

The Philadelphia data were separately weighted for these analyses. Using one randomly sampled adult from each 2000 census public use microdata Philadelphia household, weights based on gender, race, and education were constructed to make the sample representative of city households.[8] Eleven Philadelphia respondents who refused to provide their address or nearest cross-street were excluded from analyses, resulting in a total of 331 (unweighted) Philadelphia respondents. Small amounts of missing data on these variables were imputed using an expectation maximization maximum likelihood procedure (Hill 1997).[9]

Dependent Variables

Two indices, perceived crime and perceived incivilities, were developed from the survey items. For each index, individual items were z scored and then averaged. Each had acceptable internal consistency (perceived incivilities Cronbach's α = .787, perceived crime Cronbach's α = .814). The perceived crime index included the following three items: "How much crime is there in your neighborhood?" (1 = *great deal*, 2 = *some*, 3 = *very little*, 4 = *none at all*), "How big of a problem is gun violence in your neighborhood?" (1 = *serious problem*, 2 = *somewhat of a problem*, 3 = *minor problem*, 4 = *not a problem at all*), and "Do you think illegal drugs are a serious problem, somewhat of a problem, a minor problem, or not a problem at all in your neighborhood?" (1 = *serious problem*, 2 = *somewhat of a problem*, 3 = *minor problem*, 4 = *not a problem at all*). Final index scores were reversed so that higher scores reflected more perceived crime. The perceived incivilities index consisted of the following six items: "How big of a problem is/are groups of unsupervised teenagers . . . abandoned buildings . . . abandoned vehicles . . . poorly kept yards . . . loud or noisy neighbors . . . graffiti on sidewalks and walls in your neighborhood?" Response categories for each were 1 (*serious problem*), 2 (*somewhat of a problem*), 3 (*minor problem*), and 4 (*not a problem at all*). Final index scores were reversed so that higher scores reflected more perceived incivilities.

Geocoding and Creating the GeoArchive

Survey respondents' home addresses or nearest street intersections were geocoded for all except 11 Philadelphia respondents. A GeoArchive (Rich 1995) including respondent address and specific geocoded land uses was constructed using ArcGIS geographical information system software. Land use addresses included public and private high schools ($n = 76$), subway stops ($n = 49$), expressway off ramps ($n = 120$), check-cashing stores ($n = 96$), pawn shops ($n = 30$), residential and neighborhood outpatient drug-treatment centers ($n = 34$), halfway houses ($n = 41$), and homeless shelters ($n = 39$).

Alcohol-related land uses were included as well. Pennsylvania's liquor-control laws do not divide retail liquor businesses into on-premises sales outlets (e.g., bars) and off-premises sales outlets (e.g., liquor stores), as found in most states. Instead, they have a mix of licenses dividing businesses primarily into types of alcoholic beverage sales permitted. Two types are included here: beer establishments and liquor clubs. Beer establishments ($n = 146$) include sandwich shops, delis, corner markets, and taverns licensed to sell beer for consumption on or off the premises. These also serve prepared food. Liquor clubs ($n = 194$) are nonprofit, membership-only organizations that serve beer and hard liquor for on-premise consumption only. Liquor clubs include union halls and many ethnic organizations.[10]

Land use addresses were provided by the Philadelphia Police Department, Philadelphia Department of Human Services Web page, and the Pennsylvania Liquor Control Board. Telephone directories, both hard copy and online, were used to obtain the addresses of all pawn brokers and check-cashing centers identified in the city.

The selected land-use types were grouped into the category of crime generator or crime attractor, as explained above.

Of course, not all individual facilities within a land-use type attract additional crimes or incivilities. Many may discourage crime because of conscientious place management, locations in low-crime areas, strong anticrime policies, or other factors. Put simply, not all facilities, regardless of neighborhood, generate or attract the same amount of crimes or disorders. Clarke and Eck (2003) refer to the most potent area crime generators as "risky facilities." By including in the land-use indices all the instances within each type rather than just the risky ones, we are biasing the analyses *against* finding significant land-use impacts. If the riskiest facilities are generating or attracting the most crimes and incivilities, including just those—if they can be identified—should generate the strongest impacts on perceived crimes and incivilities. If expected impacts surface using all facilities within a land-use type, risky and nonrisky, as is done here, it would attest to the importance of these facilities regardless of whether or not they are risky.[11]

Constructing Localized Land-Use Metrics: Factoring in Proximity and Density

Kernel estimation provides a way around many of the problems linked to summarizing the influence of a spatial pattern of nonresidential land uses. It was developed as a technique to estimate a smoothed probability density from an observed sample. The approach when applied to point patterns such as addresses is not dissimilar from estimating a bivariate probability density function (Bailey and Gatrell 1995). Kernel estimation routines have existed in the research literature for many decades (e.g., Parzen 1962) yet have only been applied to crime in recent years, most noticeably in the area of hot spot analysis (Bailey and Gatrell 1995; Chainey and Ratcliffe 2005).

Kernel estimation routines applied to point patterns provide a measure of intensity. Although a density function provides a measure of the number of facilities within a certain area around the respondent, an intensity measure factors in both proximity and density.

A simple (linear) intensity measure can be calculated thus,

$$\lambda_\tau(r) = \sum_{d_i \leq \tau} \left(1 - \frac{d_i}{\tau}\right)$$

where $\lambda_\tau(r)$ is the intensity value for a survey respondent r given a limiting distance or bandwidth τ, where $\tau > 0$ and d_i is the distance between the respondent and a facility within the bandwidth. The intensity value essentially seeks out all facilities i within distance τ of the survey respondent and assigns a suitable weight to each crime facility $k(i)$ such that facilities closer to the respondent will have a greater value. In this case, the weight of each facility within the bandwidth is assigned in an inverse distance manner, such that,

$$k(i) = 1 - \frac{d_i}{\tau}$$

for $d_i < \tau$, 0 otherwise.[12]

Although this approach solves the issue of relative proximity, it does not escape the problem of a suitable choice of bandwidth. To avoid an arbitrary choice of bandwidth, a computer program was written to estimate the minimum distance necessary such that every respondent was within range of a particular type of facility.[13] For example, the distances from each respondent to every homeless shelter in Philadelphia were calculated so that a value $d_{\min}$ could be estimated; $d_{\min}$ here would be the smallest usable bandwidth such that every sample respondent had at least one homeless shelter within the bandwidth. This meant that one respondent would effectively have a value of 0 for the intensity of this facility type, homeless shelters, because that one respondent was responsible for setting $d_{\min}$. Given a linear inverse distance regime, the weight $k(i)$ would effectively be 0. This provided, however, positive values for all other respondents for this facility type. This adjusts the equation at 1 such that $\tau = d_{\min}$.

In this manner, the data set, rather than an arbitrary choice, determined the value of $d_{\min}$ for each type of crime facility. A linear inverse distance intensity value was calculated for each survey respondent. This procedure avoided high occurrences of 0 and was sensitive to both the density and proximity of facilities around the survey respondent.

A single bandwidth, the lowest $d_{\min}$ value was used among the group of crime-generating land uses (subway stations, expressway off ramps, and high schools). Summing up the intensity values formed a land-use crime generator index. The same was done with the land uses that were associated with crime attractors (pawn brokers, check-cashing stores, drug-treatment centers, halfway houses, homeless shelters, beer establishments, and liquor clubs), creating a land-use crime attractor index. Within-scale reliability for each index was quite acceptable (Cronbach's α = .880 for the land-use crime generator index, .946 for the land-use crime attractor index).[14]

Other Individual-Level Predictors

Additional individual-level predictors included gender (1 = *female*, 0 = *male*), race (1 = *White*, 0 = *non-White*), household size, age, and household income. On race, the vast majority of the non-Whites were African

American, with very few Hispanics ($n = 12$) and Asians ($n = 4$). For income, an unfolding technique was used starting with breaks at $40,000 and $80,000. Final categories had ranges of $10,000, and respondents were rescored to the middle of their category, except for those in the highest category (more than $120,000; $n = 16$), who were rescored to $125,000.

Grouping

Cases were assigned to 1 of 45 Philadelphia neighborhoods using the Philadelphia Health Management Corporation's (2003) neighborhood boundaries.[15] Per neighborhood, n (unweighted) ranged from 2 (one neighborhood) to 14 ($M = 7.36$, $Mdn = 7.00$, $SD = 3.39$). The interquartile range went from 4 to 10.[16] Because prior work has shown some degree of ecological patterning to perceived incivilities, and because people living in the same neighborhood are on average more like one another than like those living in different neighborhoods, hierarchical linear models were used (Raudenbush and Bryk 2002). Because the two outcomes were somewhat correlated ($R^2 = .50$), an a priori Bonferroni adjustment was made, and the alpha level was set to .025 (Darlington 1990:250).

Neighborhood Variables

Neighborhood-level demographic variables relied on 2000 census block group data mapped to the neighborhoods. Key variables in the census block group data were aggregated to these neighborhoods through a process that estimated the percentage of each block group's population residing within the neighborhood's geographical boundaries. For socioeconomic status, four status indicators were z scored and averaged: median household income, median house value, percentage adult population with at least college, and percentage above the poverty line (Cronbach's $\alpha = .904$). For stability, percentage of owner-occupied households and percentage of households living at the same address since 1995 were averaged to create a stability index (Cronbach's $\alpha = .812$). For race, the 2000 census percentage non-White population was used.

Part I crime data were obtained from the Philadelphia Police Department and geocoded. The geocoding hit rate was 97.4 percent (see Lawton, Taylor, and Luongo 2005). The reported violent crime data for 18 months, from January 2001 to June 2002,[17] were annualized and then converted into rates per 100,000 population. Descriptive information on indicators appears in Table 1.

Table 1
Descriptive Statistics

Variable	*M*	*Mdn*	*SD*	Min	Max
Outcomes					
Perceived incivilities index	0	–.174	.72	–.77	2.05
Perceived crime index	0	–.019	.84	–1.42	1.52
Individual-level predictors[a]					
Age	48	46	16.24	19	90
Gender[b]	.59	1	.49	0	1
Race[c]	.53	1	.5	0	1
Household size	2.64	2	1.51	1	12
Household income	45,302	35,000	31,112	5,000	125,000
Crime attractor index	175.62	183.36	80.6	20.38	309.92
Crime generator index	94.31	102.17	42.01	8.7	152.61
Neighborhood predictors[d]					
Socioeconomic status (2000)	0	–.14	.88	–1.51	2.31
Stability (2000)	59.24	61.57	10.96	22.92	78.39
Percentage population non-White (2000)	55.37	51.22	32.72	4.12	98.79
Reported violent crime rate (2001-2002)	1,401.42	1,260.02	800.18	193.74	3,598.96

Note: Survey data are from 2003 Philadelphia Area Survey; Philadelphia respondents only. Individual respondent characteristics shown after weighting. Dependent variables had acceptable skewness levels ($< \pm 1$) and thus did not require logging.
a. $n = 342$.
b. 1 = female, 0 = male.
c. 1 = White, 0 = non-White.
d. $n = 45$.

Tests for spatial autocorrelation showed that the pattern was nonrandom for perceived crime (Global Moran's $I = .161$, $p < .05$) but random for perceived incivilities ($I = .028$, *ns*).[18] Therefore, a spatial lag variable was introduced in the perceived crime model. The Land and Deane (1992) two-stage procedure was followed for constructing an instrumental variable capturing generalized spatial lag across the entire jurisdiction.[19]

Model Specification and Sequence

The environmental criminology perspective on land use and victimization, and, by extension here, perceived incivilities and crime, is an individual-level perspective grounded in behavioral geography. Therefore, land-use indicators were group mean centered, thus capturing differences among respondents in the same neighborhood, pooled across neighborhoods.

To control for compositional differences across neighborhoods (Sampson et al. 2002) while gauging neighborhood structure and crime impacts, respondent demographics were not centered. Additional analyses (results not shown) were completed with group mean centered resident demographics and did not affect the pattern of significant findings shown here. Neighborhood predictors were grand mean centered to facilitate interpretation and further reduce multicollinearity.

Multicollinearity tests at both the individual and neighborhood levels showed that neighborhood status and neighborhood violent crime rate correlated too closely and could only be entered in separate models ($r = -.80$). Under this arrangement, acceptably low levels of multicollinearity were obtained.[20]

A separate model series was run for each land-use index. For each outcome, an ANOVA model (model I) was run to confirm significant between-neighborhood variation on the outcomes. For each index and each outcome, three additional models were run: with land use (model II); with land use and resident demographics (model III); and with land use, resident demographics, and neighborhood structure (model IV). There were two versions of model IV, with either status or crime. Given space restrictions, the tables show just the results of model II and model IV with crime.

Results

Perceived Incivilities

Neighborhoods significantly differed on perceived incivilities ($p < .001$, $r_{icc} = .268$) before adding any predictors. The strong average reliability estimate (.691) for the neighborhood means implied that neighbors in the same place agreed on how much disorder there was in their locale.

Crime generators. As anticipated, those living closer than their neighbors to more crime-generating land uses perceived more neighborhood disorder ($p < .01$; Table 2). For each standard deviation increase in the crime-generating land-use index (40.6), predicted perceived incivilities rose about .41, controlling for neighborhood context.

The land-use impact remained largely unchanged and significant ($b = .009$, $p < .01$) after controlling for resident and neighborhood characteristics. Those living closer to crime-generating land uses than their neighbors still saw their neighborhood as more problem ridden regardless of who they were and regardless of the racial composition, crime rate, or stability of the neighborhood. Even after controlling for all these factors, a 1 standard deviation

Table 2
Perceived Incivilities

	Crime Generators						Crime Attractors					
	Land Use Only			All			Land Use Only			All		
	b	*SE*	*p* <	*b*	*SE*	*p* <	*b*	*SE*	*p* <	*b*	*SE*	*p* <
Fixed effects												
Individual level												
Age				–.002	.002	*ns*				–.002	.002	*ns*
Female				.006	.080	*ns*				.005	.079	*ns*
White				.127	.133	*ns*				.132	.133	*ns*
Household size				.020	.027	*ns*				.021	.027	*ns*
Household income				–.003	.001	.025				–.003	.001	.025
Land use	.010	.003	.01	.009	.003	.01	.004	.001	.01	.004	.001	.01
Neighborhood level												
Stability				.007	.005	*ns*				.007	.005	*ns*
Percentage African American				.089	1.956	*ns*				.118	1.957	*ns*
Violent crime rate				.382	.105	.01				.383	.105	.01
Intercept	–.014			.121			–.013			.116		
Random effects												
Neighborhood variance	.135			.048			.135			.048		
p <	.001			.01			.001			.01		
Individual variance	.368			.371			.368			.371		
Proportional reduction in error												
Individual level	.016			.180			.014			.179		
Neighborhood level				.382						.382		

Note: Outcome is perceived neighborhood incivilities index; higher scores mean more perceived problems. Results from hierarchical linear models, individuals (weighted $n = 342$) nested within neighborhoods ($n = 45$). Unstandardized coefficients. Individual-level variables uncentered, except for land-use indices, which were group mean centered. Neighborhood-level variables grand mean centered. Coefficients for income, percentage African American, and violent crime rate multiplied by 1,000. Snijders and Bosker's formulas (1999:101-3) were used for the PRE calculations.

increase in the crime-generating land-use index increased the predicted incivilities score by .37.

Crime attractors. Results for this index closely paralleled those seen with the crime-generating land-use index. Controlling for neighborhood context, those living closer to more crime attractors than their neighbors saw more disorder than did their neighbors ($p < .01$; Table 2). The impact of crime-attracting land uses remained largely unchanged after controlling for residents' characteristics, stability, racial composition, and local crime rates.

The impacts of the two land-use indices proved roughly comparable. With only land use entered in the model, a 1 standard deviation increase in crime attractors (80.6) resulted in a predicted incivilities score .30 higher in the full model, compared to a predicted increase of .37 for the crime-generating index in the same model. Given that the outcome is an index of averaged z scores, these are substantial effects.

Other. The only other significant individual-level impact was income. Those reporting higher household income perceived fewer incivilities in their neighborhood.

Turning to ecological predictors, those living in more crime-ridden neighborhoods judged their locales more problem ridden ($p < .01$). Neither racial composition nor stability influenced the outcome. When status was substituted for violent crime, it had a significant negative impact (results not shown). The significance of neighborhood status and household income suggested multilevel impacts of status, at both the individual and neighborhood levels, on the outcome. The observed pattern of significant ecological impacts can be interpreted to support either the legal–historical perspective or the structural perspective on perceived incivilities, but not the racial one.

Perceived Crime

How much crime residents saw in their neighborhood significantly varied ($p < .001$, $r_{icc} = .296$) across locations. Neighbors in the same neighborhood, in general, strongly agreed about how much crime was afflicting their locale (average reliability of neighborhood means = .719).

Crime generators. Residents closer to more crime-generating land uses saw their neighborhood as more crime ridden ($p < .001$, full model; Table 3), even after controlling for who they were and for neighborhood features. Those 1 standard deviation higher than their neighbors on the land-use index had a predicted perceived crime score almost .6 higher.

Table 3
Perceived Crime

	Crime Generators						Crime Attractors					
	Land Use Only			All			Land Use Only			All		
	b	*SE*	*p* <	*b*	*SE*	*p* <	*b*	*SE*	*p* <	*b*	*SE*	*p* <
Fixed effects												
Individual level												
Age				–.004	.003	*ns*				–.004	.003	*ns*
Female				–.036	.074	*ns*				–.036	.074	*ns*
White				.213	.117	†				.218	.116	†
Household size				.040	.034	*ns*				.041	.034	*ns*
Household income				–.004	.001	.01				–.004	.001	.01
Land use	.015	.003	.001	.014	.003	.001	.006	.001	.001	.006	.001	.001
Neighborhood level												
Stability				.009	.006	*ns*				.009	.006	*ns*
Percentage African American				.002	.002	*ns*				.002	.002	*ns*
Violent crime rate				.451	.130	.01				.451	.130	.010
Spatial lag				.144	.521	*ns*				.153	.520	*ns*
Intercept	–.019			.222			–.019			.215		
Random effects												
Neighborhood variance	.1992			.0561			.1994			.0554		
p <	.001			.001			.001			.001		
Individual variance	.4647			.4527			.4674			.4549		
Proportional reduction in error												
Individual level	.0277			.2548			.0233			.2525		
Neighborhood level				.4673						.4675		

Note: Outcome is perceived neighborhood crime; higher scores mean more perceived crime. Results from hierarchical linear models, individuals (weighted $n = 342$) nested within neighborhoods ($n = 45$). Unstandardized coefficients. Individual-level variables uncentered, except for land-use indices, which were group mean centered. Neighborhood-level variables grand mean centered. Coefficients for income, spatial lag, and violent crime rate multiplied by 1,000. Snijders and Bosker's formulas (1999:101-3) were used for the PRE calculations.
† $.025 < p < .10$.

Crime attractors. Those living closer than their neighbors to more crime-attracting land uses perceived their neighborhoods as more crime ridden ($p < .001$), even after controlling for who they were and neighborhood features. Crime-attracting and crime-generating land uses appeared to be similarly influential. In the full model, a 1 standard deviation increase on the crime-generating index increased the predicted perceived crime score by .59. With crime-attracting land uses, the corresponding predicted increase was .45. Both of these impacts are substantial given an outcome composed of averaged z scores.

Other. Those reporting higher incomes saw their neighborhood as less crime ridden ($p < .01$; Table 3). When neighborhood status was substituted for crime, this individual-level status impact persisted ($p < .01$; results not shown). Neighborhood status itself had only a marginal negative impact on the outcome ($.025 < p < .05$; results not shown).

Turning to other ecological predictors, higher violent crime rates elevated perceptions of crime ($p < .01$). Neither racial composition nor stability demonstrated significant impacts.

Discussion

The current work investigated how the proximity and density of nonresidential land uses affected residents' views of the amount of disorder and crime in their neighborhoods. Previous work had successfully linked nonresidential land uses to assessed incivilities (Kurtz et al. 1998; Taylor et al. 1995), but two recent studies had produced conflicting findings about the impacts of these land uses on perceived incivilities (Sampson and Raudenbush 2004; Wilcox et al. 2004). The environmental criminology framework adopted here focused attention on individual-level relationships, in keeping with the framework's origins in behavioral geography, and on two types of nonresidential land uses—crime generating and crime attracting—both within and beyond each resident's neighborhood boundaries.

The pattern of results was straightforward. Controlling for who the residents were and for the structure of and amount of reported crime in their neighborhoods, those with more crime-generating or crime-attracting land uses nearby characterized their neighborhood as more crime ridden and more disorderly. The impacts of both types of land uses were substantial.

Two processes, one behavioral, one cognitive, may help explain these impacts. Those living closer to the nonresidential land uses may encounter more strangers from outside their street block on a regular basis or may be closer to groups of people congregating (Baum et al. 1978). The altered profile of activity on the street block also may link to diminished expectations of resident-based surveillance over the nearby outdoor areas (Taylor 1997). Either or both of these dynamics might be involved.

More-detailed work examining residents' local travel patterns and views about specific locations seems needed. Land-use patterns and related variations such as street width and traffic volume affect outdoor uses of space and neighboring relations (Appleyard 1981; Baum et al. 1978; Hunter and Baumer 1982). So how do these backcloth factors, along with the density, proximity, and riskiness of nonresidential land uses, shape residents' movements inside and outside their neighborhoods (Wikstrom and Ceccato 2005)? How do these backcloth patterns and activity patterns link to images of neighborhood disorder (Aitken and Bjorklund 1988) and detailed spatial templates (Brantingham and Brantingham 1981) of areas? How do these activity patterns within and beyond the neighborhood shift over time and respond to extraordinary events such as extremely serious crimes (Aitken and Bjorklund 1988)?

Of secondary interest here was learning which neighborhood factors predicted perceived incivilities and perceived crime. Results showed that those living in higher-status neighborhoods saw less disorder and somewhat less crime in their locales. Those living in higher-crime neighborhoods saw more of both. These results would seem to support, respectively, either the structural perspective on the origins of incivilities or the historical–legal perspective (Taylor 2001). According to the former, lower-status neighborhoods are afflicted with more disorder because external agents are under less pressure to maintain the quality of neighborhood life in those locations. According to the latter, crime breeds disorder—and vice versa, of course. Because neighborhood crime rates and status could not be entered in the same model, the merits of the structural perspective relative to the historical–legal view could not be assessed.

This study, like all others, has its limitations. One that we view as not too serious is the relatively low average number of respondents per neighborhood. This is not grave for two reasons. The primary focus was on estimating individual-level relationships while controlling for neighborhood context, not on ecological impacts. Furthermore, multilevel models take into account varying group sizes across neighborhoods and appropriately adjust estimates of neighborhood means.

A second potential limitation is that the study focused on extant nonresidential land-use patterns rather than changes in these patterns and the impacts of these changes over time (Aitken and Bjorklund 1988). It seems unlikely that residents' perceptions linked to crime and incivilities can "cause" nonresidential land uses to appear. Nonetheless, longitudinal work focusing on changes in nonresidential land uses, and changes in residents' assessments of crime and incivilities, especially if coupled with ongoing behavioral observations and reports of residents' activity spaces, can help to more firmly establish causality and better identify the relevant behavioral dynamics.

Third, this is a case study from one city, albeit a large one. External validity remains, as it always must, an empirical question to be answered by future work (Taylor 1994), not an a priori limitation of this study.

Finally, it seems plausible that there could be multiplicative impacts if someone lives near both crime generators and crime attractors. Because the two indices could not be entered in the same model and thus controlled before entering an interaction effect, this possibility was not examined here and awaits future work.

Perhaps several study strengths partially allay some of these concerns about limitations. First, land-use indicators addressed the "spatial mismatch" concern (Sampson and Raudenbush 2004:333), were internally consistent, closely aligned with an environmental criminology theoretical perspective, and addressed both density and proximity. Second, dependent variables demonstrated excellent measurement properties. Third, key results replicated across two outcomes. Fourth, spatial autocorrelation was controlled for where indicated. Finally, multilevel models appropriately modeled both the data clustering and varying numbers of respondents per neighborhood.

The current work investigated residents' judgments about how much disorder and how much crime there was in their neighborhood and linked those judgments to the density and proximity of nonresidential land uses thought to facilitate criminal victimization. The primary finding here was that those individuals more closely surrounded by more crime-attracting or crime-generating land uses were more likely to see their neighborhood as afflicted with more crime and disorder. Although many questions remain about the specific individual-level behavioral and cognitive processes supporting these linkages, the results strongly support investigating impacts of land use on reactions to crime within an environmental criminological framework.

Notes

1. The general land-use indicator used was the "percentage of face blocks in the census block group with mixed land use" (Sampson and Raudenbush 2004:327), where only commercial establishments were noted. In this same study, two alcohol-specific crime attractors also were combined into an index: "The presence or absence of bars and establishments with

visible signs of alcohol sales" (Sampson and Raudenbush 2004:326). The results (their Table 3) showed that neither of these nonresidential indicators affected perceived incivilities after controlling for the presence of more transient social and physical incivility indicators and for evidence of structurally driven decay and disinvestment.

2. There are of course numerous other plausible explanations besides Gordon's (1968) partialling fallacy for the failure to replicate. Very simply, Chicago is not Seattle, for example.

3. The authors do report that they carefully checked for multicollinearity and influential observations. It is possible, however, that the correlation matrices at the neighborhood level could be compatible with the largely mediated thesis here and still not show evidence of ill conditioning.

4. It is readily granted that alternative ways to group nonresidential land uses are equally plausible. For example, Wilcox et al. (2004) contrasted the effects of business-oriented nonresidential land use and non-business-oriented nonresidential land use. The grouping used here, however, aligns with the theoretical perspective being used.

5. The American Association of Public Opinion Researchers (AAPOR) promotes several standardized formulas for computing response rates (Institute for Survey Research [ISR] 2003:23). The AAPOR cooperation rate, the proportion of those contacted where a successful interview was obtained, was 27.6 percent. The interview completion rate, "which is commonly reported by survey organizations," representing the fraction of households screened and eligible where a completed survey was obtained, was 97 percent (ISR 2003:24). The nonrefusal rate was 56.8 percent. This is 1 – the refusal rate or, more specifically, 1 – (refusals ÷ the sum of interviews, refusals and break-offs, noncontacts, other eligible noninterviews, and cases where the status of the telephone number was not determined).

6. Of the numbers dialed (6,098), 3,721 resulted in households contacted. Of the latter, 496 were of unknown eligibility, and 1,881 were ineligible. Of the remaining 1,344, 1,028 interviews were completed.

7. Before weighting, and for the entire region, on gender, the PAS overrepresented females by 6 percent; on ethnicity, it overrepresented African Americans by 6 percent and underrepresented Caucasians by 7 percent. Age categories matched within 4 percentage points, except for those 71 and older who were underrepresented by 8 percentage points, probably in part because of hearing and health problems (ISR 2003:24). Census figures were taken from the Current Population Survey March 2003 supplement.

8. These weights also controlled for multiple phone lines in households. The final weights ranged from .61 to 2.27; only 1 of the 8 groups (gender × race × education) had a weight above 2.0 (White males with better than high school education). After weighting, the sample demographics closely matched the public use microdata samples of one randomly selected adult from each Philadelphia household. The discrepancies (public use microdata samples data percentage – PAS weighted percentage) ranged from –2 percent to 4 percent and averaged .25 percent (*Mdn* = –.5). The discrepancies between the 2000 census public use microdata's percentages and the weighted PAS percentages were as follows for each group:

Male	White	< = high school	0
Male	White	> high school	–2
Male	Non-White	< = high school	3
Male	Non-White	> high school	0
Female	White	< = high school	–1
Female	White	> high school	–1
Female	Non-White	< = high school	4
Female	Non-White	> high school	–1

9. The *n* and percentage of missing cases were as follows, based on all weighted Philadelphia interviews, even including the 11 that were not geocoded: household size (2, .7 percent), education (0, 0 percent), gender (0, 0 percent), age (9, 2.5 percent), race (6, 1.6 percent), and income (56, 16.0 percent).

10. State-run liquor stores selling only hard liquor and wine were excluded. There were few of them. Furthermore, because they were all run according to state guidelines, this made them different from every other type of establishment. Preliminary analysis showed they were not significantly related to either perceived incivilities or perceived crime.

11. There was no easy, cost-effective way to gauge each facility's "riskiness."

12. Other kernel functions are possible, such as the commonly used kernel density function (Ratcliffe and McCullagh 1999), though Bailey and Gatrell (1995) note that in practice most functions will behave in a similar manner.

13. A range of arbitrary bandwidths was examined, based on multiples of average street block length. Most, however, produced a zero-inflated distribution—a high zero count for crime facilities within the bandwidth around some respondents.

14. Generator and attractor scales using separate d_{min} bandwidths were formed for each individual land-use type and were summed into the appropriate multiband generator or attractor land-use index. These multiband scales were found to show slightly weaker internal consistency.

15. The Philadelphia Health Management Corporation (PHMC) has been conducting southeastern Pennsylvania's largest and most comprehensive health survey since 1983. Their neighborhoods were first defined when the survey series began in the 1980s. At that time, the PHMC researchers contacted local planners, officials, and organizers to estimate neighborhood boundaries in Philadelphia. They have maintained those boundaries over time. Close inspection of their boundaries shows a very close alignment in many parts of the city with the political wards used by Shaw and McKay (1972, map 30) to construct Philadelphia's delinquency rates in the 1920s.

16. The small *n* in some neighborhoods is not problematic. The primary focus is on the individual-level connections between land-use intensity and perceived crime and disorder, not on estimating neighborhood-level coefficients. The key purpose of the grouping by neighborhood is to control for neighborhood context while assessing individual-level relationships, an analysis of covariance via hierarchical linear modeling (HLM). The pattern of the ecological impacts is of secondary interest. Raudenbush and Bryk (2002:280-5) addressed the "validity of inferences when samples are small" (p. 280). The impacts of small group sizes depend on the parameter being estimated. The only fixed effect bias introduced, however, is a negative bias to the between-group variance estimate, $\gamma 00$. This is not an issue here because results showed that the between-neighborhood component of the outcome was significant. The small group sizes mean that cross-level interaction effects could not be estimated, but such effects were not part of the theory being tested. Perhaps more importantly, the relatively limited *n* per neighborhood should be considered in the context of the large number of available neighborhoods: "A relevant general remark is that the sample size at the highest level is usually the most restrictive element in the design" (Snijders and Bosker 1999:140). Because group size and intragroup agreement are taken into account, small groups do not unduly influence parameter estimates.

17. It was not possible, despite repeated requests, to obtain crime data continuing into 2003 to bring the crime data period closer to the field period for the survey.

18. The tests for spatial autocorrelation were not based on observed neighborhood means but rather on HLM's estimated "true" neighborhood means, after Empirical Bayes estimation and precision weighting.

19. The generalized clean instrument was composed of predicted scores from a regression predicting neighborhood-level perceived crime scores using *x* (latitude), *y* (longitude), a dummy for western location in the city, a dummy for northern location in the city, a dummy for central location in the city, and two additional variables—the number of one-person households and the number of two-person households, both from the 2000 census. The geographic dummy variables were constructed after examining scatterplots of neighborhood Empirical Bayes means by latitude, and by longitude. The R^2 for the instrumental variable was .729.

20. At the neighborhood level, with the violent crime rate as a predictor, all tolerances were above .34, and all variance inflation factors (VIFs) were below 3.1. With status as a predictor, all tolerances were above .46, and all VIFs were below 2.2.

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