Who's Minding the Kids? Pollution, Public Schools, and Environmental Justice in Los Angeles*

Manuel Pastor, Jr., *University of California–Santa Cruz*

James L. Sadd, *Occidental College*

Rachel Morello-Frosch, *San Francisco State University*

Objective. Although previous environmental justice research has focused on analysis of the disproportionate burden of environmental hazards on minority residents, few studies have examined demographic inequities in health risks among children. This article evaluates the demographic distribution of potentially hazardous facilities and health risks associated with ambient air toxics exposures among public schoolchildren in the Los Angeles Unified School District. *Methods.* We combine Geographic Information System analysis with multivariate statistics to compare enrollment and demographic information for students who attend district schools with the spatial pattern of land use, locations of toxic emissions and facilities, and calculated indices of estimated lifetime cancer risk and respiratory hazards associated with exposures to toxic air emissions. *Results.* District schools are more likely to be located in census tracts containing potentially hazardous facilities; however, these tracts actually have slightly lower cancer and respiratory health risks associated with air toxics when compared to other tracts in the district. Demographic comparisons among school sites indicate that minority students, especially Latinos, are more likely to attend schools near hazardous facilities and face higher health risks associated with outdoor air toxics exposure. *Conclusions.* These patterns of hazard exposure and health risk should be considered both in the process of siting new schools to house the rapidly growing regional student population and in remediation efforts at existing schools.

In 1999, controversy over construction of the Belmont Learning Complex rocked Los Angeles City politics. Designed to relieve overcrowding in a largely Latino immigrant neighborhood, the new, state-of-the-art school was

*Direct all correspondence to James L. Sadd, Occidental College, 1600 Campus Road, Los Angeles, CA 90041 <jsadd@oxy.edu>. We thank the California Endowment, Occidental College, University of California–Santa Cruz, and the National Science Foundation for providing funding, fellowship, and logistic support for this research. We also thank the reviewers for comments and Jennifer Wolch for helpful insights and suggestions. All views expressed are those of the authors and do not necessarily reflect the perspectives of the sponsoring organizations. The authors will share information on sources and coding information for all data for purposes of replication.

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sited in a former oil field with active methane gas leaks and soil contaminated with carcinogenic compounds, a fact that came to public light halfway through the construction process. When it was revealed that Los Angeles Unified School District (LAUSD) officials and developers had been aware of the underlying environmental hazards since the beginning of the project but had chosen to downplay the problem, the school board fired the incumbent superintendent and voted to halt construction of what was to have been the nation's costliest school.[1]

In the wake of the Belmont controversy, some suggested that the decision to site a Latino-serving school in such a problematic location reflected environmental racism.[2] This article explores whether there is, in fact, environmental inequity in the LAUSD. Specifically, we consider the relationship between existing school sites and various locational hazard and environmental health risk indicators located in census tracts within the district, including Toxic Release Inventory (TRI) facilities, toxic storage and disposal facilities (TSDFs), and indices of estimated lifetime cancer risk and respiratory hazards associated with exposures to over 148 ambient air toxics.

We find that, within the boundaries of the LAUSD, census tracts with schools have a slightly higher probability of hosting a potentially hazardous facility than tracts without schools. On the other hand, these tracts do not seem to have higher cancer and non-cancer risks associated with air toxics exposures compared to areas within the district that do not contain schools. However, demographic comparisons based on the school sites indicate that health risks associated with air toxics exposures are significantly higher for minority schoolchildren than for Anglo students. Multivariate analyses controlling for covariates such as population density, household income, home ownership, and land use patterns surrounding school sites within the LAUSD indicate that race plays a persistent explanatory role in predicting the distribution of environmental hazards and estimated cancer and non-cancer health risks associated with air toxics. Given increased scientific concern about the impact of chronic pollution exposures on children's health, the implications of these racial disparities are cause for concern.

The Literature

The issue of environmental justice has given rise to both a vibrant social movement and an outburst of social science research and policy debates. Whereas early studies, including the landmark examination of hazardous waste landfills by the United Church of Christ (United Church of Christ, 1987), found evidence of disparities in the distribution of potentially haz-

[1] For a more detailed description of the complex controversy, see Anderson (2000).

[2] Others argued that the environmental movement itself was racist, noting that the stringent environmental standards imposed on Belmont did not make sense since, for example, Beverly Hills High has its own oil-pumping facility (Hernandez, 1999).

ardous facilities, other researchers have found insignificant racial differences on a national scale after controlling for income and other covariates that could account for the location of environmental disamenities (Anderton, Anderson, Oakes, et al., 1994; Anderton, Anderson, Rossi, et al., 1994). Still other studies indicate that environmental disparities by race do exist and further suggest that at least some of these ethnic differences are due in part to discriminatory siting (Been, 1994, 1995; Been and Gupta, 1997). In general, however, researchers have found mixed results, depending on the region of the country under study (Baden and Coursey, 1997; Bowen et al., 1995; Ringquist, 1997).[3]

Our studies of the Southern California region have consistently found a disproportionate burden borne by people of color in the location of TRI facilities and TSDFs, toxic air releases, and lifetime cancer risk associated with ambient air toxics exposures (Boer et al., 1997; Morello-Frosch, Pastor, and Sadd, 2001; Sadd et al., 1999). A detailed historical study further suggests that the problem in Los Angeles County has been the siting of facilities in minority neighborhoods and not simply a market-induced move-in of minorities to lower-rent, already polluted areas (Pastor, Sadd, and Hipp, 2001).

Virtually all the previous environmental justice research, including our own, has focused on the location of hazards and potential pollution exposures relative to where people live. However, environmental issues at schools are also of potential concern. Increasing scientific evidence suggests that children may be more susceptible to the effects of environmental pollution than adults because of fundamental differences in their physiology, metabolism, and absorption and exposure patterns (see Crom, 1994; Guzelian, Henry, and Olin, 1992; Kaplan and Morris, 2000; Parkinson, 1996). Certain childhood diseases (e.g., respiratory illnesses such as asthma) are a significant health problem (Leikauf et al., 1995; Mannino, Homa, and Pertowski, 1998) and hazardous air pollutants (HAPs) or air toxics could be aggravating these problems (Burg and Gist, 1998; Leikauf et al., 1995; Ware et al., 1993).[4] Although children are certainly affected by these threats in their homes and neighborhoods, they spend much of their day in schools that may not be located in the community where they live, particularly given magnet programs and cross-town busing in major urban areas like Los Angeles.

Anecdotal, epidemiologic, and exposure studies suggest potential short- and long-term health effects among schoolchildren from outdoor and indoor air pollutants (Gilliland et al., 1999; Guo et al., 1999; Jedrychowski

[3] In this brief article, we cannot do full justice to the complicated and contentious task of assessing the overall direction of the research. For example, Szasz and Meuser (1997) argue that the bulk of the literature is supportive of the environmental justice propositions, whereas Foreman (1998) and Bowen (2001) conclude that the evidence is mixed and inconclusive.

[4] Partly because of this research, Executive Order 13045, issued in 1997, directs federal agencies to consider the particular vulnerability of children to environmental health risks.

and Flak, 1998; Schettler et al., 2001; Van Vliet et al., 1997), potentially hazardous facilities (Ginns and Gatrell, 1996; Gomzi and Saric, 1997), and pesticides (Northwest Coalition for Alternatives to Pesticides, 2000; U.S. General Accounting Office, 1999).[5] However, information on the exposures and public health impacts of pollution among children at school is generally sparse, and few researchers have focused on environmental inequalities among children (Friedrich, 2000; Kraft and Scheberle, 1995; Stephens, 1996).

Data and Methods

This article expands the discussion of children, schools, and environmental hazards with a preliminary equity analysis for one school district, the LAUSD. The LAUSD is the second most populous school district in the United States, enrolling over 700,000 students as of fall 1999, and the district covers 704 square miles. Using standard Geographic Information System procedures, we geocoded all LAUSD school locations and determined both the host census tracts and all nonschool tracts within district boundaries. This information was then joined to tract-level information on demographic, economic, and local land use variables.[6]

Locations were also linked to a set of environmental hazard indicators employed in earlier equity studies in Southern California: (1) the location of two point source hazards—the 1997 TRI facilities and high-capacity hazardous waste TSDFs, with "high-capacity" defined as those facilities processing more than 50 tons a year;[7] and (2) tract-level estimates of lifetime individual cancer risk and a respiratory hazard index, both associated with exposure to 148 ambient air toxics from both mobile and stationary sources. The cancer risk and respiratory hazard indices were derived by combining modeled estimates of ambient air toxics concentrations with corresponding toxicity data. Exposure data were derived from a recent modeling analysis undertaken by the U.S. Environmental Protection Agency's (EPA's) Cumulative Exposure Project, which estimates long-term average concentrations for 1990 of 148 air toxics for every census tract in the contiguous United States (U.S. EPA, 1998). Emissions data used in the model take into account large stationary sources (such as TRI facilities), small area service industries and fabricators (such as dry cleaners, auto body paint shops, and

[5] Many of these studies have been conducted in other countries, and it is unclear whether or not their results can be meaningfully generalized to children in the United States.

[6] The tract-level demographic information on race and income from the 1990 Census (Summary Tape Files 1 and 3) (U.S. Bureau of the Census, 1992). This demographic information was augmented by data on 1993 land use for the study area (proprietary data made available to the authors by the Southern California Association of Governments (1999)).

[7] TSDF data provided by California State Department of Toxic Substances Control (see Boer et al., 1997; Pastor, Sadd, and Hipp, 2001), and TRI data provided by the U.S. EPA (1997); locations verified (see Sadd et al., 1999).

furniture manufacturers), and mobile sources (such as cars, trucks, and aircraft). The modeling algorithm takes into account meteorological data and simulation of atmospheric processes (see Caldwell et al., 1998; Morello-Frosch et al., 2000; Rosenbaum et al., 1999; Rosenbaum, Ligocki, and Wei, 2000). The modeled concentration data and toxicity information from U.S. EPA and California EPA were then used to calculate individual lifetime cancer risks and a respiratory hazard index associated with outdoor air toxics exposures over a lifetime.

Cancer risk estimates were derived using inhalation unit risk (IUR) estimates, which are a measure of carcinogenic potency for each pollutant (U.S. EPA, 1986). Cancer risks for each pollutant in each census tract were derived with the following formula:

$$R_{ij} = C_{ij} * IUR_j,$$

where R_{ij} is the estimate of individual lifetime cancer risk from pollutant j in census tract i, C_{ij} is the concentration of hazardous air pollutant j in micrograms per cubic meter ($\mu g/m^3$) in census tract i, and IUR_j is the inhalation unit risk estimate, or cancer potency, for pollutant j in $(\mu g/m^3)^{-1}$. The cancer risks of different air toxics were assumed to be additive and were summed together in each census tract to estimate a total individual lifetime cancer risk in each tract.

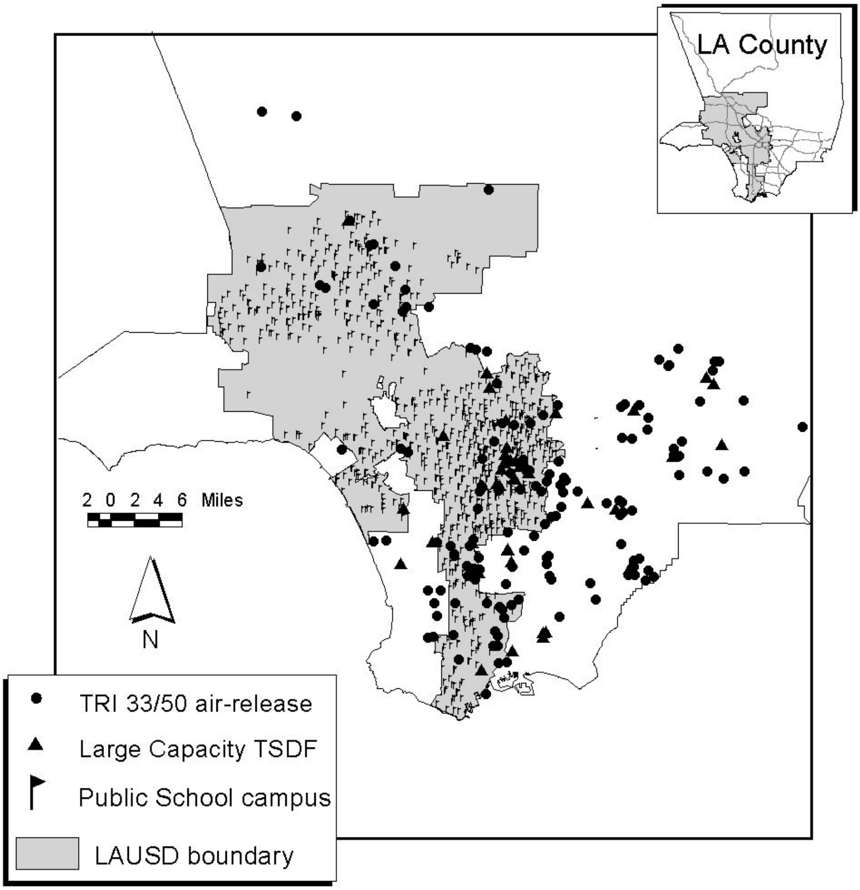
For respiratory health risks, pollutant concentration estimates were divided by their corresponding reference concentration (RfC) to derive a hazard ratio. An RfC for chronic respiratory effects is defined as the amount of toxicant below which long-term exposure to the general population of humans, including sensitive subgroups, is not anticipated to result in any adverse effects (Dourson and Stara, 1983). Respiratory hazard ratios for each pollutant in each census tract were calculated using the following formula:

$$HR_{ij} = C_{ij}/RfC_j,$$

where HR_{ij} is the hazard ratio for pollutant j in tract i, C_{ij} is the concen tration in $\mu g/m^3$ of pollutant j in census tract i, and RfC_j is the reference concentration for pollutant j in $\mu g/m^3$. An indicator of total respiratory hazard was calculated by summing the hazard ratios for each pollutant in order to derive a total respiratory hazard index. School-level information came from the October 1999 California Basic Educational Data System database (or CBEDS), an annual data collection program administered by the California Department of Education Demographic Research Unit that includes basic school information as well as data on 1997–1998 enrollment and ethnic makeup of the student population by school.

FIGURE 1

Locations of Public Schools, TSDFs (> 50 tons/yr), and TRI 33/50 Air Releases, Los Angeles Unified School District

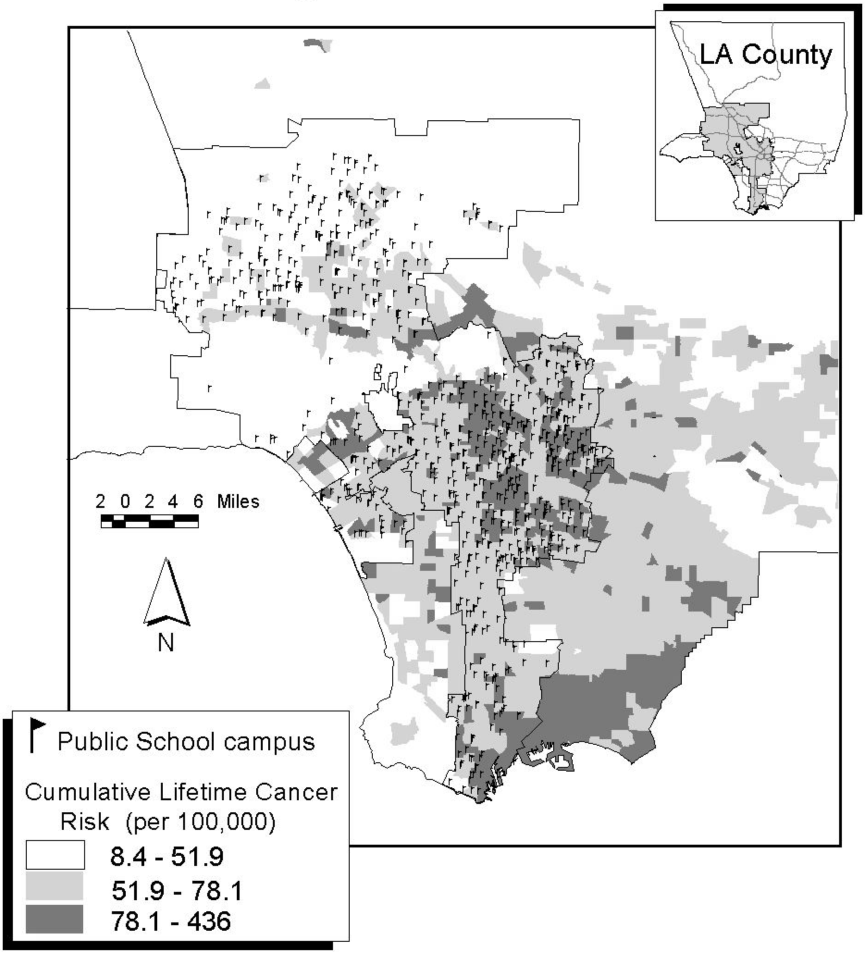


Results

Figures 1 and 2 provide a geographic summary of school locations within LAUSD boundaries and the distribution of TRI facilities and TSDFs and estimated excess cancer risk. Figure 1 indicates that a large number of potentially hazardous facilities, mostly TRI sites, are located near schools in the district, although it is difficult to draw any conclusions regarding whether these facilities are more likely to be located in tracts with schools compared to tracts without. Figure 2 indicates ubiquitously high estimated lifetime cancer risks for the whole LAUSD area, where risks exceed the Clean Air Act goal of one in a million by one to three orders of magnitude.

FIGURE 2

Public School Locations and Estimated Lifetime Cancer Risks
Associated with Ambient Air Toxics, Los Angeles Unified School District



Again, the map does not indicate definitively if school tracts have higher risk levels than nonschool tracts.

Table 1 addresses this question by comparing tracts within the Los Angeles Unified School District that do and do not contain schools. Note that there is a higher probability that school tracts will contain a high-capacity hazardous waste site or be located within one mile of such a facility. The tracts with schools are also more likely to contain or be located within one mile of a TRI facility that emits toxic substances included on the EPA's

TABLE 1

Likelihood of Schools Facing Environmental Risks

	Tracts with no schools	Tracts with schools	*t*-stat for diff.	Sig.
Percentage of tracts with high-capacity TSDF	0.5%	2.0%	–1.984	**
Percentage of tracts within 1 mile of TSDF	11.8%	16.7%	–2.054	**
Percentage of tracts with 33/50 TRI release	2.8%	7.2%	–3.006	***
Percentage of tracts within 1 mile of TRI 33/50	27.0%	38.8%	–3.675	***
Excess cancer risk	70.1	67.0	1.882	*
Respiratory hazard index	29.0	27.8	1.328	#
Number of tracts in each category	392	456		

***significant at the .01 level. **significant at the .05 level. *significant at the .10 level. #significant at the .20 level.

33/50 list.[8] However, the health risk estimates associated with air toxics exposures cut the other way: average excess lifetime cancer risks in school tracts are slightly lower at the .10 significance level. In terms of respiratory hazard, tracts with schools have slightly lower levels, although this difference is not statistically significant. Although these preliminary results may seem somewhat contradictory, note that the first two of these measures (TRI and TSDF) are limited to large, stationary facilities; the cancer and respiratory risk indicators provide estimates of potential human health risks associated with outdoor air toxics exposures originating from a myriad of mobile and stationary emission sources. In any case, schools appear to be located in tracts with hazardous facilities, but there does not seem to be a consistent tendency for them to be situated in tracts posing significantly higher estimated health risks.

We now consider environmental equity across the school population. Table 2 provides a demographic breakdown for those school sites whose host tract is within one mile of either a high-capacity TSDF or a TRI air release site on the EPA's 33/50 list; each school site is weighted by its student population, and the significance of the difference between the means for affected and nonaffected schools is calculated with a simple *t*-test, controlling for whether the assumption of equal variances holds or is rejected by

[8]The EPA 33/50 program was a voluntary pollution prevention initiative designed to reduce by half the releases and transfers of 17 high priority toxic substances during 1988–1995 (U.S. EPA, 1994). Most 33/50 chemicals were also carcinogens (either known or suspected) as classified by the Occupational Safety and Health Administration. In 1997, TRI facilities reported air releases totaling 2,346.4 tons in the study area. Of this total, 15.5 percent were chemicals in the 33/50 program.

TABLE 2

Demographics of Schools Proximate to Hazards

	% Anglo	% African American	% Latino	% Asian
High-capacity TSDF within 1 mile	2.0	8.4	85.1	4.1
No high-capacity TSDF within 1 mile	12.4	14.6	65.7	6.7
Significance level of difference	***	***	***	***
TRI 33/50 release within 1 mile	4.6	12.5	77.5	4.6
No TRI 33/50 release within 1 mile	14.9	14.1	63.1	7.4
Significance level of difference	***		***	***

***significant at the .01 level. **significant at the .05 level. *significant at the .10 level. #significant at the .20 level.

the relevant *F*-test.[9] As it turns out, Latino students are significantly more likely to be the dominant population in schools located near hazards, with nearly all other groups less likely to be near hazards.[10] The picture changes slightly when we consider the health risks associated with a range of hazardous air pollutants. Figure 3 shows the average lifetime cancer risk and the average respiratory hazard index by schoolchildren of different ethnicities.[11] Again, the Latino population bears the greatest burden of lifetime cancer risk associated with air toxics, but African American and Asian schoolchildren also face higher risks than Anglos. A similar pattern, showing smaller differences among groups, emerges for our respiratory hazard index.

Why this pattern in cancer and respiratory risk disparities for all minority groups when the TSDF and TRI results suggest that disparities in facility location mostly affect Latinos? First, the health risk estimates take into account the exposures and toxicity of pollutants rather than simply measuring proximity to emission sources; this suggests that minority schoolchildren might be concentrated near the most hazardous facilities, a pattern we found for residential demographics when we did multinomial logit and tobit regressions using the TRI data in Sadd et al. (1999). Second, as noted above, the TRI figures include only large emission sources, whereas both cancer and respiratory risk estimates are calculated from ambient air toxics

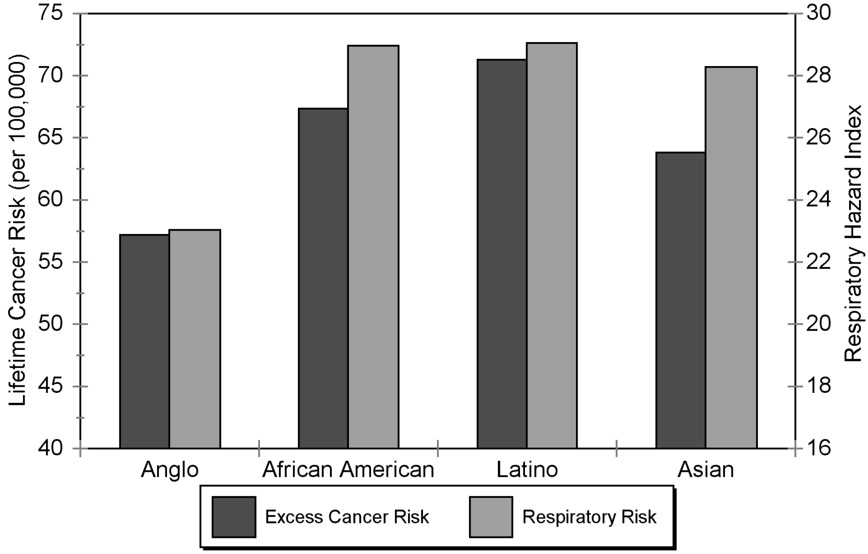
[9] The number of school sites in this analysis and the regressions reported later is less than the total number of schools in LAUSD. The difference arises because most (but not all) magnet centers are located within existing school sites; we view sites as the relevant unit of analysis, although the patterns are the same if we consider the schools separately. In any case, the demographic and environmental tests are weighted by student population in all our tables and regressions.

[10] The numbers do not add up to 100 because of a small "other" category that we do not report; this group never totals more than 0.7 percent of the school population in any subcategory by hazard location. Asians in this calculation include Filipinos, although the CBEDS data consider this group separately.

[11] In this calculation, we take the total ethnic student population and determine cancer and respiratory risk by weighting each school site's risk estimate with the number of students from each ethnic group attending the various schools (magnet and nonmagnet) at each site.

FIGURE 3

Cancer and Respiratory Risks for Schoolchildren by Race, LAUSD



concentrations originating from mobile, large industrial, and small-area emissions. Thus, the health risk estimates encompass more emissions sources than TRI hazards alone; although Latino-dominated schools may be located closer to TSDF and TRI facilities, to the extent that African Americans and Asians are concentrated in schools near freeway corridors and denser commercial and small fabricator districts, they are also likely to face higher health risk estimates.

Of course, the apparent pattern of health risk disparities revealed in Figure 3 may be attributable to other factors, and separating the potential impacts of race requires multivariate analysis. Drawing from our previous regression specifications on the HAP and cancer risk data on a neighborhood basis (Morello-Frosch, Pastor, and Sadd, 2001), we ran estimated cancer and respiratory risks as a function of the proportion of minority students within a school as well as location-specific (or tract-level) characteristics.

These tract-level variables included (1) percentage of land devoted to industrial use, with the assumption that this would have a positive effect on risk measures; (2) population density, with the prediction of a positive risk, because densely populated areas tend to have the traffic and commerce that generate hazardous air pollutants; (3) median household income, with the prediction of a negative effect, on the grounds that higher-income areas might be better able to resist environmental disamenities or that high income reflects high land values and hence is negatively correlated with disamenities; and (4) the rate of home ownership, with an assumed negative effect, on the grounds that home owners are more stable, more committed

TABLE 3

Relationships of School Demographics to Hazard Location

	OLS Regressions		Logit Regressions	
	Cancer Risk	Respiratory Risk	TRI 33/50 Releases within 1 mile	High-Capacity TSDF within 1 mile
% of land devoted to industial use	0.121	0.039	0.060	0.034
	*2.701****	*1.402#*	*6.234****	*4.324****
Population density per square mile	0.086	0.033	0.000	0.002
	*8.169****	*5.005****	*0.158*	*1.243*
Median household income	–0.033	–0.011	–0.015	0.003
	–1.080	*–0.565*	*–2.268***	*0.311*
Rate of home ownership	–0.168	–0.067	0.031	–0.007
	*–3.407****	*–2.173***	*3.419****	*–0.653*
% minority students attending school site	0.117	0.078	0.043	0.102
	*2.111***	*2.274***	*3.509****	*3.508****
F-value/log likelihood	96.8***	41.2***	623.0	454.3
Adjusted (Nagelkerke) R^2	0.456	0.260	0.323	0.232
N	572	572	572	572

NOTE: Coefficients are given on the same line as the variable description with *t*-scores shown below in italics. Panel reports results for both OLS regression and logit regression.

***significant at the .01 level. **significant at the .05 level. *significant at the .10 level. #significant at the .20 level.

to an area, and hence more likely to resist environmental disamenities (see Hamilton, 1995, for a “political” model along these lines).

We also decided to run logit regressions predicting whether or not the host tract for a school site was within one mile of a high-capacity TSDF or a TRI site releasing chemicals on the EPA’s 33/50 list. The expected direction of effect for the various tract-level variables is the same; although the positive effect of population density on hazard location is not standard in the literature, our exploration of the Los Angeles area in Boer et al. (1997) indicated TSDFs are often very close to densely populated areas in Southern California, and hence density is often positive (although usually insignificant) once one controls for land use.

Several caveats are in order. First, the reader should keep in mind that the universe in these regressions is 572 school sites in the Los Angeles district; this does not describe all the tracts in Los Angeles County, and hence there are many areas with environmental disamenities not being captured by this analysis. Second, this is not a causal model (see Pastor, Sadd, and Hipp, 2001, for an example of that) but rather a sort of multivariate mapping of the landscape consistent with the approach taken in the literature. However, if the ethnic composition of the school still has an impact after the introduction of these reasonable control variables, then this might suggest a problem of environmental inequity.

The results of the regression and logit models are depicted in Table 3. For the two risk regressions, all variables are signed as expected, although the income variable is insignificant and the land use variable attains significance only at the .20 level. Most important, the proportion of students of color at a school site is a significant explanatory factor even controlling for the other socioeconomic and land use variables. In the logit regressions on hazard location, the population density variable is positively signed but insignificant (as expected), the home ownership variable is unexpectedly positive for the TRI 33/50 release measure, and both household income and home ownership are insignificant for the TSDF measure. However, the percentage of students of color is highly significant and positive: there is an association between school demographics and hazard location.

We also conducted a series of regressions in which we entered the percentage of students from the three major ethnic groups (African Americans, Latinos, and Asians) as separate variables. All the tract-level variables retained their sign and significance pattern; for the risk regressions, all the minority student variables were positively signed, but only the African American variable attained significance (at nearly the .10 level for cancer risk and the .05 level for the respiratory index), whereas all three variables were positively signed and significant at the .01 level for the hazard location logistic regressions.

Since the student demography variable might simply be picking up the characteristics of the residential neighborhood or reflecting past demographic history,[12] we regressed school racial composition on neighborhood demographics and used the residuals to determine whether schools had more or fewer minority children than one would predict from the neighborhood characteristics.[13] This differenced variable—which we call in Table 4 "minority students relative to area"—enters the cancer risk regression at a .18 level of significance, with median household income gaining significance and the other variables retaining their strong .01 showing from the

[12] We thank a reviewer for pointing us in this direction. For an excellent review article arguing that environmental inequities cannot be separated from larger urban development patterns, see Pulido (2000). Of course, the focus in this article is exactly to tease out the different influences.

[13] The actual specification is inverse rather than linear, a fit confirmed by visual inspection of the data. Similar to many school districts, LAUSD has numerous "magnet" schools that are located in areas with high minority populations specifically to promote integration, and these schools attract many Anglo children. Meanwhile, because "white flight" begins earlier from public education than from the residential neighborhood, many schools in whiter areas are more minority than simple neighborhood demographics would suggest. The inverse specification enjoys a slightly higher *R*-squared and is much closer visually to the actual pattern. As might be guessed, there is no way to conduct a similar exercise for the three separate minority groups, and so we eschew that extension here.

TABLE 4

Relationships of School Demographics to Hazard Location Controlling for Neighborhood Ethnic Composition

	OLS Regressions		Logit Regressions	
	Cancer Risk	Respiratory Risk	TRI 33/50 Releases within 1 mile	High-Capacity TSDF within 1 mile
% of land devoted to industial use	0.140 *3.176******	0.053 *1.924**	0.065 *6.907******	0.042 *5.445******
Population density per square mile	0.090 *8.745******	0.036 *5.615******	0.002 *0.941*	0.004 *2.234****
Median household income	–0.071 *–2.936******	–0.037 *–2.491****	–0.029 *–5.490****	–0.020 *–2.845******
Rate of home ownership	–0.136 *–2.947******	–0.043 *–1.485#*	0.043 *5.181******	0.010 *1.030*
Minority students relative to area	0.085 *1.355#*	0.023 *0.593*	0.015 *1.285#*	0.045 *2.421****
F-value/log likelihood	95.9***	39.9***	635.5	468.9
Adjusted (Nagelkerke) R^2	0.454	0.254	0.301	0.196
N	572	572	572	572

NOTE: Coefficients are given on the same line as the variable description with *t*-scores shown below in italics. Panel reports results for both OLS regression and logit regression.

***significant at the .01 level. **significant at the .05 level. *significant at the .10 level. #significant at the .20 level.

parallel regression in Table 3. As can be seen in Table 4, the minority variable falls dramatically in a regression on respiratory risk but attains a .05 level in a regression on proximity to high-capacity toxic storage and disposal facilities (with the other significant variables in that regression obtaining the expected signs). Although this pattern is less compelling than that in Table 3, it still suggests that risk differs by the race of children even after controlling for the ethnicity of local residents. Thus, although neighborhood-focused efforts should have positive spillovers on local schools, there may also be a need for school-based remedies.

Conclusion

As the environmental justice movement gains ground in the regulatory and political arenas, new areas of research and policy making are likely to emerge. One of the most critical may involve the intersection of environmental justice and children's health, particularly as new studies suggest the increased susceptibility of young populations to pollution and other hazards. Within this field, the issue of pollution at school sites may draw increasing attention.

This article has looked at this issue in the LAUSD. In this case, environmental hazards and estimated cancer and respiratory risks do appear to be distributed unequally, with a disproportionate share of the burden accruing to minority schoolchildren. This disparity persists even after controlling for other covariates such as land use, population density, median household income, and rates of home ownership.

The impacts of these environmental disparities may go beyond public health per se to concerns about impacts on educational achievement and future human capital development. Indeed, in some communities, parents have complained of diminished school performance among their children due to health effects associated with outdoor and other pollution (Diette et al., 2000; Perera et al., 1999; Kaplan and Morris, 2000), and respiratory problems, some aggravated by pollution, have been associated directly and indirectly with lower academic performance (Fowler, Davenport, and Garg, 1992; Bener et al., 1994; Austin et al., 1998; Lenney, 1997; Maier et al., 1998; National Environmental Trust, Physicians for Social Responsibility, and Learning Disabilities Association of America, 2000; Spee-van der Wekke et al., 1998). We believe that understanding the potential association between increased hazard exposures and health risks with diminished school performance is an undertaking worthy of further research.

Numerous caveats regarding the analysis of this article are in order. First, this is an examination of environmental risk for the Los Angeles area, where research has consistently demonstrated environmental inequity along other dimensions, and the results cannot be generalized beyond the study area. Second, the results here are obtained via relatively straightforward methods, including simple comparisons and parsimonious regressions; of course, given that this is an initial article in this emerging field, such simplicity may be a virtue.

Despite these qualifications, the patterns revealed in this research should encourage some thinking about the need for strict environmental standards for new schools slated for construction in the post-Belmont era in Los Angeles and elsewhere.[14] Building schools in urban areas may necessarily involve "brownfield" lands or locations near pollution sources. If excess caution stops construction, this will have a negative impact on the educational opportunities and futures of minority schoolchildren. At the same time, any future construction plans should measure and seek to minimize disparities in environmental hazard distributions among minority schoolchildren in the district, particularly given the overall poorer health status of these populations (U.S. EPA, 1992), and remediation efforts should be similarly targeted. After all, if negative environmental conditions may be

[14] For a national-level discussion of the environmental challenge facing school expansion, see Center for Health, Environment, and Justice (2001).

disproportionately affecting minority children's health, we are compelled to ask: on this issue, who's minding the kids?

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