

Structural violence, urban retail food markets, and low birth weight

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Abstract

This paper investigates urban retail food markets and health in Syracuse, New York. A structured observational analysis found that a majority of corner markets do not sell fresh produce or low fat dairy products, but conduct a lively business selling lottery tickets, cigarettes, and liquor. A comparison of census tracts with and without access to supermarkets that sell fresh produce and other healthy food found that pregnant women living in proximity to a supermarket had significantly fewer low birth weight births than other pregnant women regardless of income level.

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Introduction

This article examines urban retail food markets and health in Syracuse, New York. Concerns about food markets initially came up during a series of focus groups of community members who were brought together in March and July 1999. At those meetings the focus group participants expressed concerns about local access to healthy foods and called attention to the lack of supermarkets in much of urban Syracuse. Focus group results suggested that small corner stores, the only source of food for many of the focus group participants, were pre-

dominately selling pagers, beer and non-food items. Also, according to these participants, the food items were often spoiled and overpriced.

In light of the community focus group findings we systematically investigated the marketing of health-promoting food, and non-food items such as cigarettes, alcohol and lottery tickets, in urban Syracuse in two types of retail outlets, corner stores and supermarkets. Then, through the use of individual-level and census tract-level quantitative data we compared the presence or absence of a full service supermarket in a given census tract, and the per capita sale of lottery tickets, to a specific type of prenatal medical condition—intrauterine growth restriction (IUGR)—known to cause low birth weight.

IUGR is defined as fetal growth that falls below the 10th percentile for gestational age (on standardized

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growth charts). Using IUGR of full-term infants is more precise than using low birth weight alone, because IUGR of full-term births avoids the bias of including premature births in the analysis (Gilbert and Danielsen, 2003).

The data presented in this article are part of a larger study on maternal and child health, funded by the Health Resources and Services Administration, titled “Innovative Models to Analyze and Address Racial, Ethnic and Geographic Disparities in Maternal and Child Health Outcomes.” The goal of this larger study was to use population-level data and program data to identify areas for further analysis in the area of racial and ethnic health disparities. This work integrates epidemiological, environmental, and ethnographic methods, to examine racial and ethnic inequality in low birth weight, premature births, and infant death, as well as the risk factors associated with those disparities. IRB approval was obtained from the Upstate Medical University.

Literature review

Low birth weight and IUGR

Low birth weight is a key aspect of the disparity in birth outcomes between white babies and babies of color (Lane et al., 2003). Obstetricians count the pregnancy gestational period as lasting 40 weeks; a pregnancy that lasts until the end of the 37th week is said to be “full term” and a baby that emerges prior to 37 weeks is said to be “premature.” Babies whose growth falls below the 10th percentile for their gestational age (on standardized growth charts) have IUGR (Steward and Moser, 2004). A full-term infant with IUGR weighs less than 2500 g (about 5.5 lb) at birth.

IUGR is associated with future learning problems if the growth of the fetal brain is restricted (Frisk et al., 2002). A growing body of literature suggests that IUGR may lead to heart disease, high blood pressure and type II diabetes in adulthood (Simeoni and Zetterstrom, 2005). The known etiological factors for IUGR are maternal hypertension (pre-eclampsia), maternal substance use (tobacco, alcohol, cocaine), and multiple births (twins, triplets) (Gluckman and Hanson, 2004). Two additional factors have been found in human and animal studies to impede fetal growth: (1) maternal malnutrition, particularly inadequate intake of micronutrients (Ludvigsson and Ludvigsson, 2004;

Mitchell et al., 2004; Sram et al., 2005; Wu et al., 2004) and (2) maternal exposure to stressors (Landrigan et al., 2004; Lesage et al., 2004; Schreuder et al., 2006).

Urban retail food availability

Achieving an adequate diet depends not only on sufficient purchasing power, but also on access to reasonably priced food (Cubbin et al., 2001; Kaufman et al., 1997; Lee and Cubbin, 2002). Despite the abundance of food in this country, an increasing number of Americans suffer from a lack of access to affordable and nutritious foods (Putnam et al., 2002), particularly in urban areas where there is a dearth of supermarkets (Morland et al., 1992). Compared to people living in higher-income areas, residents of low-income, urban neighborhoods have very limited access to high quality food, enjoy fewer options in the variety of foods available to them, and pay higher prices for groceries (Bolen and Hecht, 2003). Scholars from the UK have labeled neighborhoods lacking access to healthful food as “food deserts” (Wrigley et al., 2003; Lang and Caraher, 1998). Whether such “food deserts” are indeed widespread, however, and the extent to which they are public health risk factors has been questioned (Cummins and Macintyre, 2002). In part due to poor nutrition, the rates of obesity, heart disease, and diabetes (Flagel et al., 1998; Johnson et al., 2001; Kieffer et al., 2006; Putnam et al., 2002) are growing rapidly (Barnes and Schoenborn, 2003; Flagel et al., 1998) particularly among African American (Diaz et al., 2005; Johnson et al., 2001; Lower Mississippi Delta Nutrition Research Consortium, 2004; Okosun et al., 2003) and other inner-city residents (Cox et al., 1998; Dannelly et al., 2005; Drownowski and Specter, 2004; Hann et al., 2001; Johnson, 2005; Johnson et al., 2001; Kingston and Smith, 1997; Neumark-Sztainer et al., 2002; Okosun et al., 2003; Olson, 1999) often leads to disproportionate rates of premature death (Gardiner, 2004).

Beginning in the 1960s supermarket chains began to leave many inner cities. Four supermarkets closed in Syracuse prior to 1975. This shift left smaller, corner markets to serve as the primary food sources for many inner-city residents as few of the urban poor had transportation to suburban grocery stores. Store owners, interviewed by researchers in other cities, argue that new supermarkets require substantial amounts of land that are often not available in inner-city neighborhoods (Bolen and

Hecht, 2003; Cassady and Mohan, 2004; Cotterill and Franklin, 1995; Morland et al., 1992) and inner-city store owners claim that the percent of all of their income paid out for overhead costs is substantially higher than suburban store owners thus legitimizing higher prices (Cassady and Mohan, 2004; Cotterill and Franklin, 1995).

Owners of small, corner markets say that their food costs are higher for various other reasons including the lack of space available to inventory surplus foods (Hall, 1983; Kaufman et al., 1997; Morland et al., 1992) and the fact that produce and other perishables have short shelf lives (Bolen and Hecht, 2003; Drewnowski and Specter, 2004). Moreover, corner store owners with limited space report that they must focus on selling products that have the strongest demand, which, unfortunately, may mean alcohol, tobacco, and unhealthy snack foods (Bolen and Hecht, 2003; Drewnowski and Specter, 2004). Thus, as supermarkets left the inner city for the suburbs the cost of food in urban areas increased. Analysis of food store prices has shown that a grocery cart of identical or similar items would cost more in an inner-city corner market than in a larger suburban supermarket (Kaufman et al., 1997). Because healthy foods are often more expensive and less available in poor areas (Morland et al., 1992), low-income households often select more economical, and lower quality items in order to save on food costs. In a 1992 study, food prices in Syracuse were higher in the poorest areas than in the suburbs (Crockett et al., 1992). While we were not able to identify any more recent studies comparing urban and suburban food prices in the Syracuse area, this finding has been recently replicated in other cities (Block and Kouba, 2006).

Marketing of non-food items

The marketing of cigarettes, alcohol, and drug paraphernalia by corner stores has been identified as potential risk factors for the racial/ethnic disparity in low birth weight (Shiao et al., 2005). Both alcohol and tobacco abuse can lead to poor fetal growth and consequent low birth weight (Visscher et al., 2004). Malt liquor in 40 oz containers, a feature of the offerings at inner city corner stores in many parts of the United States (Bluthenthal et al., 2005), is not only cheaper than other types of alcohol, but also the 40 oz container of malt liquor provides the drinker with the ethanol-equivalent of five shots of whiskey.

Structural violence and environmental risk versus individual responsibility

Structural violence emphasizes the role of unhealthy environments in poor health and shortened survival (Lane et al., 2004). Structural violence is a conceptual model in which “preventable harm or damage... [is caused by environments] where there is no actor committing the violence or where it is not meaningful to search for the actor(s); such violence emerges from the unequal distribution of power and resources or, in other words, is said to be built into the structure(s)” (Galtung, 1969; see also Weigert, 1999; Farmer, 2004).

In contrast, the predominant public health approach to solving health disparities focuses on health promotion to individuals, with the goal of having each person take responsibility for his/her own health. Americans everywhere are bombarded daily with commercial and public service messages urging them to change their lifestyles, and thus to improve their health. There is no doubt that with such lifestyle changes people can improve their own health. For example, eating more nutritious foods and not smoking are demonstrably effective in improving an individual's health. Likewise, people *want* to adopt “healthier lifestyles.” But, while individual health behavior is important, there are limits to how much an individual can and will accomplish. Many parents living in inner cities are forced to survive on low-wage jobs and often have limited means of accessing supermarkets to purchase health foods.

Methods

This work uses a multilevel methodological approach to investigate the impact of urban retail food markets and health—specifically low birth weight—in Syracuse, New York (Rubinstein et al., 2000). The research integrates epidemiological, environmental, and structured observational methods.

The setting: Syracuse, the Onondaga County seat, is the fifth largest city in New York, with a 2000 population of 147 306, which is comprised of 64% European Americans, 25.3% African Americans, 3.4% Asian, 1.1% Native American, and 5.8% of people of two or more or other racial ancestries, among whom 5.3% have Hispanic ethnicity. The 2000 Syracuse median household income was \$25 000, compared with the median United States household income of \$41 994. A total of 31.3% of

Syracuse residents live at or below the federal poverty level, compared with 13.3% in the United States.

Epidemiological data: The epidemiological analyses used a database of all births in the city of Syracuse (2000–2001), which was drawn from the Central New York Perinatal Data System—a population-based birth registry that captures all birth certificate information and additional quality improvement data items for use by maternal and child health administrators, planners and evaluators—and the Electronic Birth Certificate database. This combined database contains 4506 birth records, of which 54% are white, 35% African American, 3.2% Latino, 5% Asian, and 3% Native American. Although the research focused broadly on health disparities among the several communities of color in the Syracuse area, due to small numbers of residents of other races and ethnicities, the analyses presented in this article compare African American and white residents only.

Environmental data: The neighborhood-level information was compiled at the level of the census tract, using data from 2000–2001 on the 57 city of Syracuse census tracts. The census tract-level environmental data includes measures on pregnancy outcomes (e.g. low birth weight, infant mortality), as well as poverty and other economic indicators. All data were calculated in the form of a rate, using variables from the 2000 census as population denominators. From this database, we identified 25 census tracts with the lowest level of health and social risks and six census tracts with the highest levels of health and social risks. This division was based on an aggregate score for low birth weight, premature births, infant deaths, poverty and other economic indicators. Our analyses do not classify race or ethnicity as a risk factor, nor do we classify census tracts into high or low risk based on race or ethnicity.

Structured observations of corner stores: We conducted structured observations of 36 randomly selected small retail outlets (18 in the high-risk and 18 in the low-risk census tracts) that are licensed to sell food, lottery tickets, tobacco, and alcohol. The corner stores comprise two types of establishments, according to the National Association of Convenience Stores: *convenience stores* and *grocery markets*. The community residents/focus group participants refer to these businesses interchangeably as “corner stores,” a term which we use in this article to distinguish the small local stores from

supermarkets. In the structured observations we found that these two types of stores were nearly indistinguishable in terms of size, location, and products sold. In each group of 18 stores in the high and low categories, there were five convenience stores and 13 grocery markets. The structured shopping analysis was conducted as follows: We defined variables for observation based on earlier ethnographic work (Lane et al., 2001) and reviews of the literature, conducted pre-tests and added more variables based on the findings of the pre-tests (e.g. the presence of ATMs, and the sale of lottery tickets). After the initial pre-testing of each variable measurement, we developed and field-tested data collection instruments, following which we developed a coding framework for recording and analyzing the observational data.

Lottery sales: We filed a Freedom of Information Act request to obtain data from the New York State Lottery, for all lottery sales by retail outlet for Syracuse for the years 2000–2002. These data were entered into a database at the level of retail outlet. They were also coded by census tract and entered into a database with the environmental data described above (e.g. low birth weight, infant mortality, poverty and other economic indicators).

Supermarket map analysis: We considered a retail outlet to be a supermarket if it sold a variety of types of food, produce, low-fat dairy and often other items, including cookware, cosmetics, and household products. During the years 2000–2002, Syracuse had seven supermarkets within, and four immediately outside the city boundary. Using maps from the 2000 US Census website, we plotted a one-half mile radius around each of these supermarkets. If this one-half mile radius fell within the boundary of a census tract it was categorized as a “supermarket census tract,” otherwise it was categorized as a “non-supermarket census tract.” We assessed the impact of the health risks associated with supermarket and convenience stores on low birth weight in full-term newborn infants. Using the database of all births in Syracuse during 2000–2001 as described above, we identified those variables that were significantly associated with IUGR in bivariate analyses. These variables included the mother’s race (African Americans have higher IUGR), receipt of Medicaid, (a proxy for low income), pre-eclampsia (a medical condition associated with high blood pressure during pregnancy), multiple births (twins, triplets), prematurity, fertility medications, and the use of tobacco, alcohol, or

cocaine during pregnancy. Receiving public assistance and being a teenager were not associated with full-term IUGR.

We then conducted a logistic regression analysis to examine the association between pregnant women's residence in a supermarket, or non-supermarket census tract, and IUGR. We removed from the sample all births in which a known biological risk factor for IUGR was present including multiple births; those in which the mother used tobacco, alcohol, or cocaine; or those affected by fertility medications, prematurity, or pre-eclampsia. We characterized the remaining low birth weight births in the sample as "unexplained full term IUGR." We next performed a logistic regression analysis, with residence in a supermarket or non-supermarket census tract as the risk factor, full-term unexplained IUGR as the outcome, and controlling for both mother's race (African American, white) and Medicaid insurance (yes, no).

Results

Corner stores

The median family income of the low-risk census tracts (\$44 572) is about 60% above the median family income in the high-risk census tracts (\$17 632), a finding that is expected because poverty was one of the variables by which the categories were chosen. Although race/ethnicity was not a variable to determine the categories of high- and low-risk, people of color comprise nearly three times the proportion of residents in the high risk compared with the low-risk census tracts. The higher proportion of people of color in the high-risk census tracts reflects their much higher rates of poverty in Syracuse.

Table 1 presents the findings from the corner store analysis. The structured shopping exercise demonstrated that there were few differences between the corner stores in high- and low-risk census tracts. Frankly, in neither area could the stores be characterized as contributing to the health of the neighborhoods in which they were located. We found that the corner stores featured extensive cigarette ads, with prominent glass cigarette displays on the front counters. Alcohol, especially 40 oz malt liquor, was often allocated more space than the dairy products. Only about one-quarter of the stores in each area sold produce, although the type of produce was very limited (e.g. two tomatoes

Table 1

Characteristics of corner markets, stratified by high- and low-risk census tracts, Syracuse, NY, 2003

	High-risk census tracts (<i>n</i> = 18 stores)	Low-risk census tracts (<i>n</i> = 18 stores)
Produce—any	27.8%	22.2%
1% milk	22.2%	11.1%
2% milk	66.7%	66.7%
Whole milk	94.4%	94.4%
Milk out of date	11.1%	11.1%
Whole milk—mean price	\$3.72 per $\frac{1}{2}$ gal	\$3.63 per $\frac{1}{2}$ gal
Cheerios—mean price	\$3.44	\$3.96
Infant formula	61.1%*	27.8%*
Alcohol products up front by cashier	33.3%	38.9%
Cigarettes prominently displayed by cashier	83.3%	88.9%
Cigarette ads prominently displayed	88.9%	94.4%
Blunts	94.4%	94.4%
Lottery tickets	83.3%	83.3%
ATM machine in store	44.4%	50.0%
Dust on food boxes	44.4%	44.4%

* $p < 0.05$.

in one store) and was sometimes rotten. More stores in the high-risk area sold 1% milk and in both high- and low-risk areas the price of milk was over twice the cost than in suburban areas. A majority of corner stores in both areas also sold blunts, which are flavored cigars that are commonly used to wrap marijuana for smoking. The only statistically significant difference among the variables in Table 1 was that more stores in the high-risk area sold infant formula.

We were struck by the lively business in lottery sales; 15 of the 18 corner stores in both the high- and low-risk areas sold lottery tickets. The mean yearly lottery ticket sales per store in the high-risk census was \$249 904, compared with \$167 501 in the low-risk census tracts. We examined this issue in greater detail and found that the small corner and convenience stores sold 68% of all lottery tickets in the city of Syracuse. We then divided the Syracuse census tracts into three groups based on the per capita yearly lottery purchases, which we compared with the median household income for each census tract. As presented in Table 2, the median household income was inversely proportionate to the per capita lottery purchases, and these figures were significantly different between each stratum.

Table 2

Per capita lottery purchases and median household income for 55 census tracts in Syracuse, NY divided into three groups based on per capita yearly lottery purchases^a

Mean per capita yearly Lotto purchases ^b	Median household income ^b
\$595	\$22 942
\$185	\$24 682
\$49	\$33 942

^aExcluding the central downtown census tract, with city, county and federal governmental offices and the mall census tract.

^b $p < 0.001$ between each stratum.

Supermarkets and full term IUGR: We then compared the presence or absence of a supermarket in or within one-half mile of a census tract with the proportion of IUGR in that census tract. A more precise analysis would be to use the actual addresses of the pregnant women in each census tract. However, because of patient confidentiality restrictions we were not able to obtain the actual addresses. Table 3 presents the demographic data, median household income, proportion of minority residence, births, and IUGR in the 24 supermarket census tracts and the 33 non-supermarket census tracts.

We next performed a logistic regression analysis, with residence in a supermarket or non-supermarket census tract as the risk factor and full-term unexplained IUGR as the outcome with mother's race (African American, white) and Medicaid insurance (yes, no) as confounders. As presented in Table 4, controlling for race and Medicaid, the infants of mothers who resided in a non-supermarket census tract were *three and one-third times* as likely to have full-term unexplained IUGR, compared with infants of mothers living in a supermarket census tract. The second important finding in this analysis is that by including supermarket as a variable, race and Medicaid were no longer statistically significant. Living in proximity to a full service supermarket may thus explain much of the racial and poverty disparities in fetal growth.

Lottery sales and full term IUGR: The above association of non-supermarket census tracts and IUGR led us to compare per capita lottery sales (during 2000–2002) in each census tract and the proportion of “unexplained” IUGR in that census tract. We divided the 55 residential census tracts in Syracuse (excluding the downtown and mall census

Table 3

Comparison of SES and infant health indicators by census tracts associated with and without supermarkets, Syracuse, NY

	Supermarket census tracts $n = 24$	Non-supermarket census tracts $n = 33$
Median family income	\$36 136 ^a	\$31 701 ^a
Proportion of residents of color (%)	32 ^a	34 ^a
Singleton full-term births ^b	900	943
Actual # of full-term unexplained IUGR babies ^b	10	23

^aNo statistically significant difference between supermarket and non-supermarket census tracts.

^bMultiple births, premature births, and those with pre-eclampsia, fertility medications, tobacco, cocaine, and/or alcohol have been removed from the sample.

Table 4

Logistic regression of full-term unexplained IUGR and supermarkets in Syracuse, NY^a

Covariate	Adjusted OR (95% CI)	p -Value
Supermarket	3.38 (1.26–9.09)	0.02
Maternal race	0.49 (0.21–1.14)	0.10
Medicaid	0.92 (0.40–2.09)	0.80

^aOutcome of full-term unexplained IUGR and exposure of residence in a census tract, with or without access to a supermarket.

tracts) by $< \$400$ per capita lotto purchases or $\geq \$400$. The mean unexplained IUGR in the lower per capita lotto census tracts was 1.3%, compared with 2.4% in the high per capita lotto census tracts. This difference, however, was not statistically significant ($p < 0.09$, Student's t -test).

Census tracts with higher per capita lotto purchases have greater poverty, as described earlier, and they have significantly more minority residents. To partially control for this source of bias, we conducted a second analysis that included only the 15 census tracts with over 50% minority residents, as presented in Table 5. We divided the census tracts by per capita yearly lottery purchases (over \$400 versus less than \$400), a division that resulted in the two groups of census tracts being quite similar in terms of median household income, proportion of minority residents, and access to a supermarket. Although the differences did not reach statistical significance, full-term unexplained IUGR was

Table 5

Per capita lottery purchases by IUGR for 15 census tracts in Syracuse, NY with over 50% minority residents, divided into two groups based on the mean per capita yearly lotto purchases (2000–2002)

Mean per capita yearly Lotto purchases	Median household income	% Minority residents	% Census tracts within $\frac{1}{2}$ mile of a supermarket	% Unexplained full-term IUGR
\$503	\$19 772	75.5	44	2.79
\$135	\$19 338	70.6	50	1.34

doubled in the group of census tracts where residents spent nearly four times as much per person on lottery tickets.

Discussion/conclusion

Several health risks are associated with the location and business practices of retail food outlets in Syracuse, which constitute forms of structural violence. There is a paucity of fruits, vegetables, and low fat dairy in many neighborhoods. Consumers who do not own cars must take city buses or arrange for help with transportation to get to supermarkets to purchase these items. The corner stores rack up extensive sales of the New York State-run lottery and per capita lotto purchases are significantly higher in census tracts with greater poverty. The corner stores also prominently market tobacco products and many devote more shelf space to alcohol—including malt liquor in 40 oz containers—than to dairy.

In Syracuse, New York, nearly two thirds of African American children under age five live in poverty. Moreover, the city has the distinction of having the second highest Latino child poverty rate in the nation. Infants of color are at risk for low birth weight, as a result of IUGR. If pregnant women were to increase their intake of healthy foods, such as fresh fruits and vegetables, arguably their health and their children's health might be improved. On the face of it, this is a simple matter of personal choice. Yet, as we have documented in this paper, there are a number of environmental structural barriers to women making those choices. Psycho-social research has demonstrated that the choices that people make are strongly influenced by the social and environmental contexts in which those choices are made (Kurtz, 2001; Smith and Mackie 2000; Link and Phelan, 1995; McLeroy et al., 1988).

The data presented in this article demonstrate an association between access to supermarkets and

reduced risk for IUGR. Access to supermarkets, therefore, may be a critical environmental-level protective factor for healthy birth outcomes. Alternative explanations are also possible. The distribution of supermarkets is influenced by economics, whereby supermarkets are built in wealthier communities. Although we controlled for poverty by adding Medicaid insurance as a variable in the logistic regression, aspects of living in an impoverished neighborhood may still influence birth weight in ways that our analysis could not capture. Also in neighborhoods with fewer supermarkets, violence and drug-related arrests often are more frequent. The stress of living in neighborhoods with these characteristics may itself contribute to IUGR.

The finding that corner stores in the high risk census tracts were slightly, but not significantly, better (compared to low risk tracts) in terms of availability of produce, 1% milk, and less up-front marketing of alcohol and tobacco products may be a consequence of these venues serving as a major source of food in these neighborhoods due to the lack of available supermarkets. The only statistically significant difference, the sale of infant formula, likely indicates that in these lower socioeconomic neighborhoods there are more families with infants. Despite the slight advantage of corner stores in the high-risk areas they are still insufficient primary sources of healthful food.

Investing in healthy food seems a simple choice. However, this individual choice is limited by the social context in which these choices are made. In this paper we demonstrate that patterns of marketing, regulation and food distribution together form the context in which individual choices are restricted. IUGR, which our analyses found to be associated with lack of supermarkets, is a health condition with potentially profound individual and public health consequences. Protecting vulnerable infants from this harm is a matter of concern for public policy.

The closing of supermarkets, and their resultant near-absence from the central city, is an example of structural violence. Fullilove (2004) has demonstrated that the loss of supermarkets, small businesses, and other forms of neighborhood devastation occurred in many US cities in the latter part of the 20th century. While supermarkets are private businesses, their widespread loss in densely populated areas is a public policy concern. Promulgating such public policies as tax relief to subsidize and support the opening of private businesses in these neighborhoods could contribute to revitalizing these areas. The findings of our study suggest that such public policy actions should place a high priority on supporting the opening of supermarkets in at-risk neighborhoods.

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