Birth weights and the geography of poverty

by Katherine O'Regan and Michael Wiseman

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In the past, efforts to understand and alleviate poverty have focused on its incidence and persistence among all households, without reference to the location of these households. For this work the traditional tools for the study of poverty have sufficed. The Panel Study of Income Dynamics (PSID), for example, collects data on individual and household characteristics over time, but the only geographical information it provides is a code for county and state.[1] Recent explorations of poverty in urban ghettos, however, have led many to believe that where a family lives matters— that the prospects for leaving poverty are in part influenced by the neighborhood and its social environment. If this hypothesis is to be tested, poverty researchers must find means to describe the neighborhoods in which the poor live and to measure what it is about these areas that affects the ability of the poor to better their lives.

Most current work on the geography of urban poverty is based on study of the incidence of poverty by census tract. Tracts, according to the Bureau of the Census, are "small, relatively permanent areas into which standard metropolitan statistical areas (SMSA's) and certain other areas are divided for the purpose of providing statistics for small areas. When census tracts are established, they are designed to be homogeneous insofar as is reasonable, with respect to population characteristics, economic status, and living conditions. Tracts generally have between 2,500 and 8,000 residents."[2]

Tract-based data have a number of shortcomings as a basis for studying the relationship between poverty and location.

In the first place, the census is taken only once a decade. Comparison of the 1970 and 1980 censuses indicates that in some cities neighborhoods are changing rapidly.[3] It is difficult to derive an understanding of the dynamics of neighborhood change from a once-in-a-decade glimpse. And because tracts are established on the basis of population size and not area, and once established, tracts are rarely changed, tracts in old cities are very different from tracts in younger ones. They tend to be smaller and, because population in the poverty areas of older cities has often declined more than that of inner-city areas of new cities, to have smaller populations. As a result, comparisons across city types drawn on the basis of tract data reflect to an unknown extent simply differences in the grid imposed by the tract maps. Third, while census tracts may make a convenient proxy for neighborhood, a household located near a tract boundary is presumably affected by tract characteristics on both sides of the line. In such a circumstance the characteristics of the tract in which the household falls may not reflect what is going on in its proximity. Few studies of the geography of poverty account both for immediate tract characteristics and circumstances in tracts close enough to have spillover effects.

If census data have shortcomings for research on urban poverty, they are even more inadequate for determining local poverty policy. As long as national policy proposals emphasized innovations in income maintenance, to be applied irrespective of location, census data and census-type surveys such as the Current Population Survey were appropriate. But more recent policy proposals have emphasized local innovation and political action. Census-based data are outdated and generally too coarse for informing community planning and action. Nor can they be much refined. Information on locale is restricted by the need for the Bureau of the Census to protect the confidentiality of all material it obtains. To meet the needs of both research and policy, therefore, we believe it is essential to develop supplements to the census.

Institutional data to supplement the census

Institutional records—data on individuals and households that are collected in conjunction with existing public programs, are, in our opinion, the most promising means for

supplementing the census. Many such data exist in every large metropolitan area. Mailing addresses for recipients of Aid to Families with Dependent Children, for example, and records of housing subsidies and unemployment compensation pinpoint the locations of welfare recipients and the unemployed. Police incident reports include addresses that can be used to chart the location of the victimization that is so much a part of the lives of the urban poor. Health records can be used to plot the incidence of health problems associated with low-income status.

In this article we illustrate the use of institutional data by studying the changing incidence of babies with low birth weights across neighborhoods in Oakland, California. Our analysis is based on the assumption that low birth weights are an indication of social distress. First we analyze the census tracts of Oakland to determine, using a variety of definitions, which can be classified as "underclass" neighborhoods. "Underclass" is subject to a variety of interpretations. We use the term simply to refer to nonelderly adults who have a low probability of moving through legitimate means to self-support. "Underclass areas" are neighborhoods with an exceptional concentration of underclass persons. We then impose our geographical map of rates of low birth weights on these neighborhoods to see to what extent they match. If the geographical distribution of low birth weights, as well as other family-related events detectable with institutional data, can shed light on the geography of poverty, we can use such data to chart the changing locales of poverty since the 1980 census. Such information is essential both as a basis for understanding the dynamics of poverty concentration and for planning and execution of neighborhood-based poverty policy. Despite the reservations cited above, we use tract information. But as will be seen below, we pay special attention to developments in areas adjacent to tracts with significant poverty concentration.

Poverty and birth weights

On the birth certificate of each infant born in the United States is the child's birth weight in grams. Although much of the information on birth certificates is confidential, county health departments in many areas regularly tabulate births by certain characteristics, including weight, race, and, at least in Oakland, California, the census tract of the mother's residence. By pediatric convention, a birth weight below 2,500 grams (about 5.47 lbs.) is considered to place the infant at exceptional health risk.[4]

Poverty and low birth weights are linked for a number of reasons: households with low incomes may not be able to afford adequate prenatal health care;[5] health care that is available may be of lower quality; the nutritional intake of low-income mothers is poorer than that of more affluent mothers; poor mothers probably have less information about prenatal care; and finally, poor people in general are in poorer health than the more well-to-do, so it is reasonable to assume that their babies will be less robust than those born to healthier women.

Empirical studies have demonstrated a correlation between various socioeconomic characteristics and low birth weights.[6] The incidence of low birth weight is greater, for example, among births to unmarried women, women of low socioeconomic status (as measured by education), and teenagers. These are the groups at substantial risk of persistent poverty and, if they live in urban ghettos, inclusion in the underclass. Race is closely associated with the incidence of low birth weights: black infants are more than twice as likely to be underweight as are whites.

Obviously the incidence of low birth weights can be altered by health and nutrition services. Changes in the availability of such services may reduce the incidence of low birth weights independent of other neighborhood developments. There is little evidence of significant variation in service levels in Oakland over the period studied here.[7] We therefore assume that changes in the incidence of low birth weights are the consequence of changes in the general circumstances of the city's low-income population.

Defining poverty neighborhoods

The revival of interest in neighborhood effects on poverty coincides with the work on the underclass of William Julius Wilson and his colleagues at the University of Chicago.[8] Subsequent empirical work by Erol Ricketts and Isabel Sawhill classified census tracts as underclass on the basis of the proportion of families with children that are headed by women, the proportion of families receiving public assistance, the proportion of men not in the labor force, and the dropout rates for teenagers in high school.[9] Mark Hughes shifted discussion from people (the members of the ghetto underclass) to places (the impacted ghetto).[10] He defines tracts as "impacted" if levels of the factors used by Ricketts and Sawhill as underclass indicators exceed twice the median values for all tracts in the surrounding metropolitan areas. Thus impactedness is based on metropolitan rather than national standards. He then examines these tracts in relation to one another and with respect to the central business districts, and in relation to all tracts in a metropolitan area with substantial poverty populations. We follow Hughes's methodology, with the awareness that the relative character of a neighborhood is not meaningful in studying the consequences of living in a neighborhood for its inhabitants. Eventually neighborhood conditions must be evaluated on absolute terms.

Poverty neighborhoods in Oakland

Oakland is the third largest city in the San Francisco Bay Area. In 1988 its population was 350,000. It contains 104 census tracts. In 1984 the Association of Bay Area Govern-

ments published a study of Alameda County in which census data were used to define poor neighborhoods.[11] The analysis was based on sixty-seven demographic and socioeconomic tract characteristics covering demographic variables (e.g., percentage of population under age 5); racial and ethnic variables (e.g., percentage black); household types (e.g., percentage of persons in family households); educational attainment (e.g., percentage of persons over age 25 who had not completed high school); income (e.g., mean family income); labor force involvement (e.g., percentage of persons age 16+ in the labor force); mobility and commuter patterns (e.g., percentage of households with no vehicle); and housing (e.g., rate of renter occupancy). Factor analysis was used to reduce the sixty-seven variables to nine variables that captured most of the variation in the data. Scores for each factor were computed for each of the 785 census tracts in the five-county area and then clustering techniques were employed to group all tracts into seven "social types." These included (1) most affluent areas; (2) recently developed areas; (3) average-income families; (4) areas of older population; (5) small households; (6) lower-income families; and (7) urban poverty.

The 41 tracts in the "urban poverty" category in Oakland manifest all of the characteristics associated with underclass areas in the literature. They also tend to be spatially clustered (with two exceptions) into two groups (see Figure 1). Using a different and simpler measure of poverty—a poverty rate of 30 percent or higher within a tract—we found 37 poor tracts, of which 31 were in the urban poverty category of the Association of Bay Area Governments.

Low birth weights in poverty neighborhoods

Following standard health statistics convention, we define low-birth-weight rates as the percentage of the total births in a tract made up of infants weighing less than 2,500 grams. For all births during the years 1979–81, this rate was 12.2 percent within the poverty tracts and 7.7 elsewhere in Oakland. Given that the national low-birth-weight rate is 6.8 percent,[12] clearly the poverty tracts in Oakland exhibit exceptionally high rates.
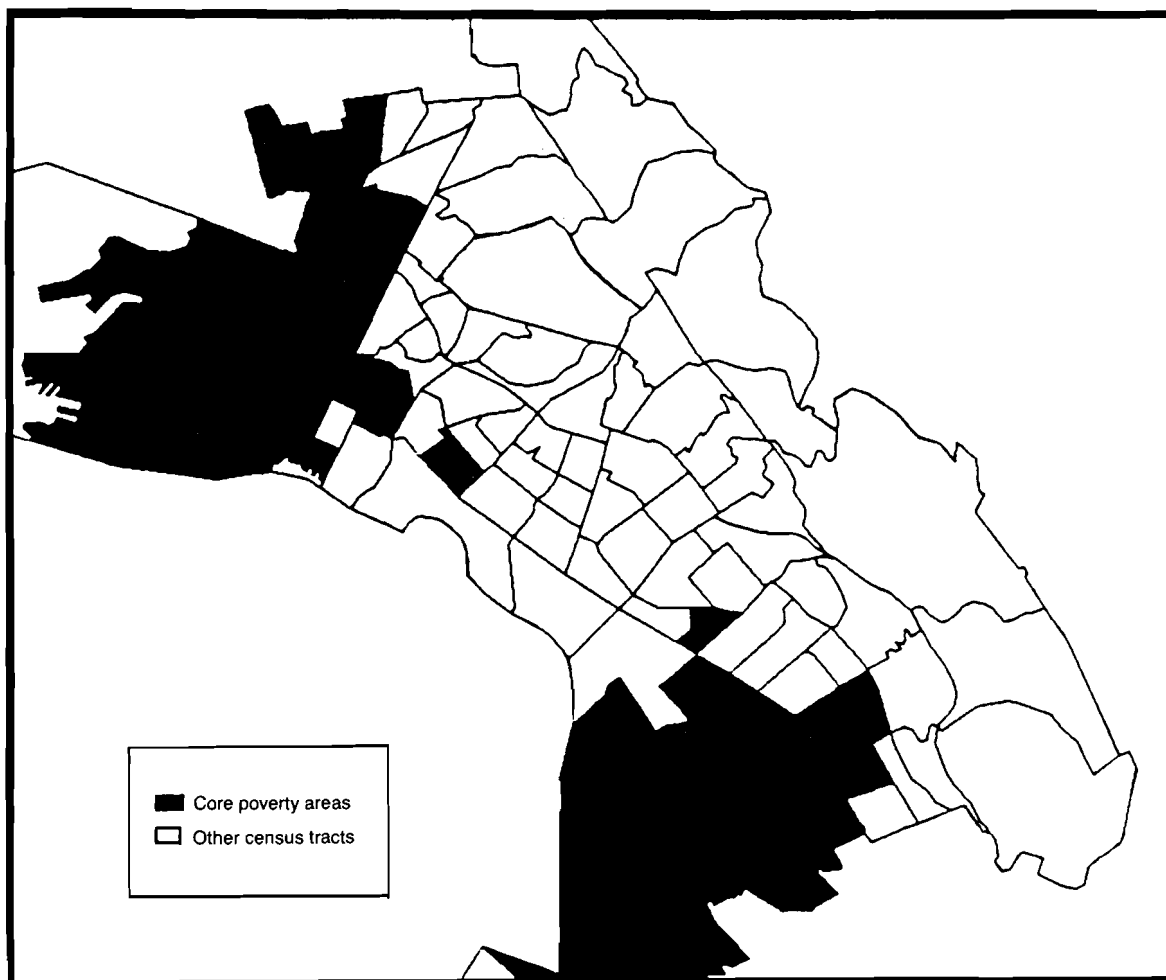

Figure 1. Oakland Poverty Areas Identified by Procedures of the Association of Bay Area Governments

We ranked census tracts by their low-birth-weight rates and designated the 39 tracts with the highest incidence of low birth weights as high poverty. Of this group 29 fell into the urban poverty cluster under the definition of the Association of Bay Area Governments and 25 were high poverty tracts using the criterion of 30 percent or more of the households with incomes below the poverty line. When we eliminated eighteen tracts with too few births to provide reliable estimates of the low-birth-weight rate, we found a correlation of .65 between tracts with over 30 percent poor and low-birth-weight rates, and a correlation of .72 between tracts with low-birth-weight rates and those classified as urban poverty. We feel that these correlations are close enough to enable us to use low-birth-weight rates to estimate changes in the boundaries of poverty areas over the time since the 1980 census.

Estimating boundaries of poverty areas

We define boundaries of poverty areas in two ways. First, given the fact that analyses of poverty tracts show that they tend to be contiguous,[13] we look at the situation in those tracts immediately adjacent to tracts designated as poverty areas in the study by the Association of Bay Area Governments. There were 26 tracts sharing a border or corner with this poverty area in 1980. We use the term "intermediate" for these tracts and "periphery" for the remaining Oakland tracts.

Our second approach to defining contiguity involves using the clustering procedure that was used to define the urban poverty tracts in the first place. We select the 26 tracts outside of the poverty areas with the highest scores on the poverty factor. This gives us two sets of tracts with features "intermediate" between those of the core and periphery areas: one set is defined by spatial contiguity with the core; the second by a contiguity in characteristics as measured by the poverty factor isolated in factor analysis.

There is of course overlap between the two groups of intermediate tracts. In Figure 2 we have redrawn the tract map of Oakland and identified five tract groups. The first, identi-
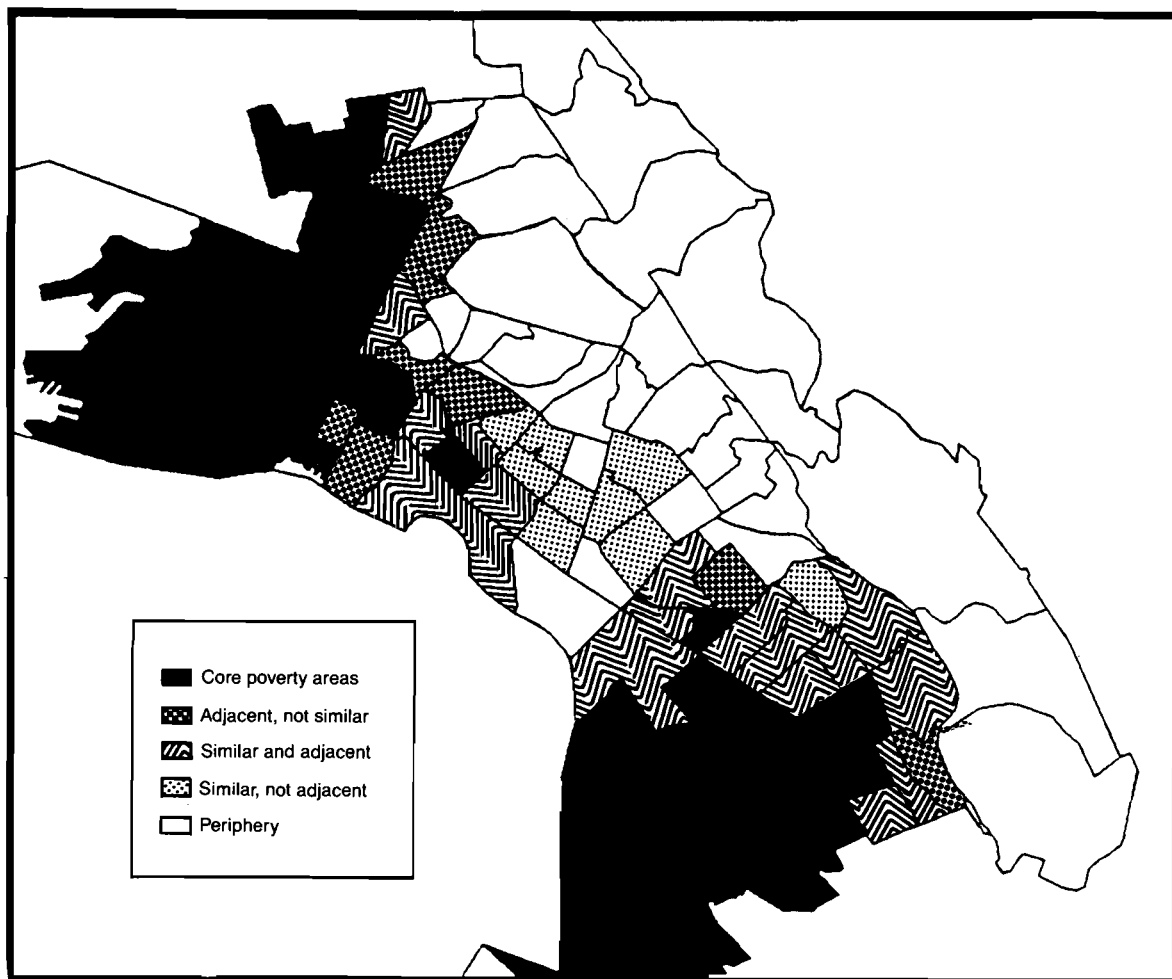

Legend:
- ■ Core poverty areas
- ▦ Adjacent, not similar
- ▨ Similar and adjacent
- ▨ Similar, not adjacent
- ☐ Periphery

Figure 2. Tracts Peripheral to the Core Poverty Area Based on Adjacency and Similarity Definitions

fied by the solid pattern in the legend, is the urban poverty core. The second group is made up of those tracts that are geographically adjacent to the core but not "similar" to the poverty tracts, when similarity is judged by the factor analysis results. The third group of tracts is both adjacent and similar. Group four is made up of tracts with characteristics that are similar to the poverty tracts but which are not immediately adjacent to them. The last group is the residual: those tracts neither adjacent nor similar to the poverty core. Again, there are 41 tracts in the core. Of the remainder, 9 are adjacent but not similar, 17 are adjacent and similar, 9 are similar but not adjacent, and 28 lie in the periphery. We emphasize that the decision to identify precisely 26 tracts as adjacent in either sense is strictly ad hoc, and we will return to the general problem posed by the absence of theoretical guidance for such choices in our conclusions.

Table 1 reports low-birth-weight rates for 1979–81 and 1984–86 for the core identified by the Association of Bay Area Governments and for intermediate and peripheral tracts, using both the spatial contiguity and character similarity criteria for identifying intermediate tracts. Looking first at the 1979–81 data, the low-birth-weight rate declines as we move outward from the core. While the same progression persists five years later, the intermediate-zone low-birth-weight rate has moved closer to that of the core. In both cases, however, the rates beyond the intermediate zone have also increased. This result is not particularly sensitive to the definition of core poverty area employed; a similar figure which identifies the 30 percent poverty tracts as the core reveals the same progression from core to periphery and the same convergence of low-birth-weight rates over time. It does appear that tract characteristics rather than physical proximity provide a better definition both of zones and of

Table 1

Low-Birth-Weight Rates by Area, Oakland, 1979–81 and 1984–86

| | No. of Tracts | Incidence of Low Birth Weight by Alternative Area Definition | | | |
| | | Spatial Contiguity | | Character Similarity | |
		1979–81	1984–86	1979–81	1984–86
Core	41	12.2%	12.0%	12.2%	12.0%
Intermediate	26	9.1	10.2	8.8	10.4
Periphery	37	6.6	7.5	6.2	6.5

Note: Core areas are those tracts classified as "urban poverty." Intermediate areas are either adjacent to the core areas (spatial contiguity) or have the highest scores on the poverty factor outside of the core areas (character similarity). The remaining areas are the periphery.

tracts at risk: note the greater disparity between core and intermediate zones in the early period and the more pronounced intermediate zone change apparent in the data based on tract characteristics.

Here we run into a problem of interpretation that is discussed in several analyses of changes in the character of high-poverty tracts over time. The developments revealed by Table 1 need not be the result of a spreading of poverty. Rather, the central tracts could be emptying out and, as a result, women at risk of low-birth-weight deliveries may simply now be more likely to live in the adjacent tracts. If this were the case, the share of total births occurring in poverty areas would be decreasing, and the share in the intermediate tracts would be going up. In fact, no significant population shift has occurred; the proportions of births occurring in each area have remained virtually unchanged.

Oakland's racial composition is changing. Other things equal, if black infants are more at risk of low birth weights than infants from other groups (this issue is a matter of controversy), changes in this indicator may simply result from changing race composition of the population. While we doubt that such changes would be sufficient to explain the development apparent in Table 1, we are currently working with more disaggregated data to study low-birth-weight incidence among blacks alone.

Comparing low birth weights to other indicators

Table 1 indicates that conditions in what we have identified as intermediate tracts in Oakland have deteriorated since 1980. If low-birth-weight rates are markers for more com-

plex developments, such changes should appear in other poverty-related data.

One of the harshest features of poverty concentration in older cities is the association of such concentration with crime. Indeed, as John DiIulio has forcefully pointed out,[14] such neighborhoods combine households which produce most street criminals with those who suffer the most as victims. If rising low-birth-weight rates reflect general deterioration in neighborhood conditions, the deterioration should show up in measures of criminal activity. Numerous studies have found a positive relationship between area poverty rates and crime rates.[15]

Because of reporting problems and the additional difficulty that crime reports in Oakland are available by beat but not census tract, we utilize Health Department data on deaths by homicide and by "police action."[16] Ideally we would like to count homicides where they occur, but the Health Department data are organized by residence of the deceased, not the place of death. We are, therefore, assuming that the number of one's neighbors who meet violent ends is an indicator of neighborhood character, regardless of where the deaths occurred.[17] We also assume that the propensity of the Oakland Police Department to dispatch persons through "police action" has not changed appreciably.

Table 2 shows deaths by homicide or police action as a share of all deaths in the core, intermediate, and peripheral areas of the city under both definition systems for 1979–81 and 1984–86. The results are consistent with what we discovered using birth data: over the first half of the decade of the 1980s, conditions in the intermediate areas deteriorated. But the

message of the homicide data differs somewhat from the results for birth weight. Here the identification of intermediate tracts on the basis of spatial contiguity seems to produce a sharper contrast between core and intermediate areas in 1979–81 and a more dramatic change between periods than is apparent when the similarity-of-character criterion is used. Also, conditions in the core itself have deteriorated. This suggests that changes in homicide incidence may be driven by factors that differ from those identifying neighborhoods with exceptional incidence of low birth weights. As was true for the birth weights data, additional normalization is needed before we can draw more substantial conclusions. Total deaths in a tract are in part a function of the age distribution of the population, and there is no reason to believe this is the same for core and intermediate areas. It would be useful to study the sensitivity of the results to adjustments for age distribution once the results of the 1990 census are available.

Conclusions

Broadly speaking, we can distinguish three objectives in research on the spatial dimension of urban poverty: (1) developing and testing models of the consequences of neighborhood for the persistence of poverty; (2) modeling the social and economic processes that produce the conditions that are expected to generate neighborhood effects; and (3) explaining the location or geography of the neighborhoods those social and economic processes create. Progress on any of these fronts requires much more building on the theoretical foundation laid by Wilson and his colleagues in each of these areas.[18]

Despite the importance of theoretical development, this paper has focused on empirical opportunities. We have argued that progress on all three fronts requires information with finer spatial identification and more frequent observation than is possible using census data. Institutional data provide opportunities for study of the spatial development of poverty, offering in some cases both more precision geographically and more frequent reporting. Our results confirm for Oakland what those who work with census data have suspected for many cities: Important changes have occurred in the geography of poverty in that city since the 1980 census. In particular, it appears that areas of poverty are spreading, and that changes in the spatial incidence of low birth weights are associated with changes in the spatial incidence of another indicator of neighborhood deterioration, the share of deaths attributable to homicide.

Although our results underscore the ad hoc character of most of the empirical research on the geography of poverty, we believe that in studying the geographic evolution of poverty, there is more to work with than the census. ■

Table 2

Share of "Homicide and Police Action" in Deaths by Area, Oakland, 1979–81 and 1984–86

| | No. of Tracts | Homicide/Police Action Share by Alternative Area Definition | | | |
| | | Spatial Contiguity | | Character Similarity | |
		1979–81	1984–86	1979–81	1984–86
Core	41	3.6%	4.0%	3.6%	4.0%
Intermediate	26	2.7	3.5	3.4	3.8
Periphery	37	1.8	1.4	1.3	1.0

Note: Core areas are those tracts classified as "urban poverty." Intermediate areas are either adjacent to the core areas (spatial contiguity) or have the highest scores on the poverty factor outside of the core areas (character similarity). The remaining areas are the periphery.

(Notes on following page)

[1]Institute for Social Research, University of Michigan, *A Panel Study of Income Dynamics: Procedures and Tape Codes (Documentation), 1985 Interviewing Year* (Ann Arbor, Mich.: University of Michigan, Institute for Social Research, 1988), pp. 104, 701. Work is now under way to merge PSID observations with data on certain characteristics of the census tracts in which the surveyed households are found.

[2]U.S. Department of Commerce, Bureau of the Census, *1980 Census of Population and Housing, Census Tracts, United States Summary* (Washington, D.C.: U.S. Government Printing Office, 1984), Appendix A, p. A.1.

[3]Erol R. Ricketts and Ronald B. Mincy, "Growth of the Underclass, 1970-1980," *Journal of Human Resources*, 25 (1990), forthcoming.

[4]Helen Chase and M. A. Byrnes, "Trends in 'Prematurity,' United States, 1950-67," *Vital and Health Statistics*, U.S. Department of Health, Education, and Welfare Publication No. 72-2030 (Washington, D.C.: U.S. Government Printing Office, 1972).

[5]S. D. Singh, D. Torres, and J. D. Forrest, "The Need for Prenatal Care in the United States: Evidence from the 1980 National Natality Survey," *Family Planning Perspectives*, 17 (1985), 122-123.

[6]For summaries of this work, see Selma Taffel, *Factors Associated with Low Birth Weight, United States, 1976*, U.S. Department of Health, Education, and Welfare, Public Health Service, National Center for Health Statistics, Vital and Health Statistics, Series 21, No. 33, 1980; Helen Chase, *Trends in Low Birth Weight Ratios, United States and Each State 1950-1968* (Rockville, Md.: U.S. Department of Health, Education, and Welfare, 1973); and Mark Rosenzweig and Paul Schultz, "The Behavior of Mothers as Inputs to Child Health: The Determinants of Birth Weight, Gestation, and Rate of Fetal Growth," in *Economic Aspects of Health*, ed. Victor Fuchs (New York: National Bureau of Economic Research, 1982).

[7]There is some evidence that use of medical care by pregnant women declined nationwide in the early 1980s. See U.S. House of Representatives, Committee on Ways and Means, *Background Material and Data on Programs within the Jurisdiction of the Committee on Ways and Means* (Washington, D.C.: U.S. Government Printing Office, 1989), p. 841. A positive change in the level of services available to mothers in Oakland occurred in 1979, when a local health care initiative increased services in an attempt to deal with the problem of low birth weights. See Urban Strategies Council, *A Chance for Every Child: Oakland's Infants, Children, and Youth at Risk of Persistent Poverty* (Oakland, Calif.: Urban Strategies Council, 1988), p. 29.

[8]See, for example, Wilson, *The Truly Disadvantaged: The Inner City, the Underclass, and Public Policy* (Chicago: University of Chicago Press, 1987; and Wilson and Loïc J. D. Wacquant, "Poverty, Joblessness, and the Social Transformation of the Inner City," in *Welfare Policy for the 1990s*, ed. Phoebe H. Cottingham and David T. Ellwood (Cambridge, Mass.: Harvard University Press, 1989).

[9]Erol R. Ricketts and Isabel V. Sawhill, "Defining and Measuring the Underclass," *Journal of Policy Analysis and Management*, 7 (1988), 316-325. For a discussion of the state of measurement and definition of the underclass, see *Focus*, 12:1 (Spring and Summer 1989).

[10]See Mark Alan Hughes, "Misspeaking Truth to Power: A Geographical Perspective on the Underclass Fallacy," forthcoming in the *Annals of the Association of American Geographers*; and "Concentrated Deviance and the 'Underclass' Hypothesis," *Journal of Policy Analysis and Management*, 8 (1989), 274-281.

[11]See Association of Bay Area Governments, *Alameda County Social Area Analysis* (Oakland: ABAG, 1984).

[12]U.S. Department of Health and Human Services, *Vital Statistics of the United States, 1986*, Volume I, *Natality* (Hyattsville, Md.: National Center for Health Statistics, 1988), p. 91.

[13]See Hughes, "Misspeaking Truth to Power," and the Association of Bay Area Governments, *Alameda County Social Area Analysis*.

[14]John J. DiIulio, Jr., "The Impact of Inner-City Crime," *The Public Interest*, No. 96 (1989), pp. 28-46.

[15]See, for example, Richard Quinney, "Structural Characteristics, Population Areas, and Crime Rates in the United States," *Journal of Criminal Law, Criminology, and Police Science*, 57 (1966), 45-52; Lynn A. Curtis, *Criminal Violence* (Lexington, Mass.: D. C. Heath, 1974); and K. D. Harries, *Crime and the Environment* (Springfield, Ill.: Charles C. Thomas, 1980). There is some debate over whether it is the absolute poverty level or some measure of relative poverty which is relevant; for reviews see Judith R. Blau and Peter M. Blau, "The Cost of Inequality: Metropolitan Structure and Violent Crime," *American Sociological Review*, 47 (1982), 114-129; and S. Messner, "Regional and Racial Effects on the Urban Homicide Rate: The Subculture of Violence Revisited," *American Journal of Sociology*, 88 (1983), 997-1007.

[16]We are grateful to Sally Howlett, Director of Information Systems for the Alameda County Health Care Services Agency, for making these data available to us.

[17]Empirical work focused strictly on homicide rates has also found a positive association between poverty and homicides. See Colin Loftin and Robert H. Hill, "Regional Subculture and Homicide," *American Sociological Review*, 39 (1974), 714-724; Robert Nash Parker and M. Dwayne Smith, "Deterrence, Poverty, and Type of Homicide," *American Journal of Sociology*, 85 (1979), 614-624; William C. Bailey, "Poverty, Inequality, and City Homicide Rates: Some Not So Unexpected Findings," *Criminology*, 22 (1984), 531-550; and Kirk R. Williams, "Economic Sources of Homicide: Reestimating the Effects of Poverty and Inequality," *American Sociological Review*, 49 (1984), 283-289.

[18]See note 8.