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THE ASSOCIATION OF NEAR POVERTY STATUS WITH CANCER INCIDENCE AMONG BLACK AND WHITE ADULTS

Kevin M. Gorey, PhD, MSW and John E. Vena, PhD

ABSTRACT: This cumulative incidence study was accomplished among adults in Upstate New York metropolitan areas (Buffalo, Rochester, Syracuse and Albany—1979–1986). It used a new ecological socioeconomic status measure—near poverty status (i.e., below 200% of the federally established poverty criterion, including the poor and near poor)—and observed its association with site-specific cancer incidence (lung, stomach, cervix uteri, prostate, colon, rectum and breast). Findings were: 1) near poverty status is directly associated with each cancer site's incidence and the strength of the associations are similar among blacks and whites for each one and 2) the prevalence of exposure, of living in high near impoverishment areas, is nearly seven-fold greater among blacks; prevalence ratio [PR] = 6.74 (95% confidence interval [CI]:5.07,8.99).

INTRODUCTION

Racial group disparities which are consistent with relative black disadvantage on cancer incidence, mortality and survival have been observed in the United States for all sites combined as well as for many specific cancer sites. The known sociodemography of the U.S. has implicated socioeconomic status (SES) differences as a salient explanation for these between-racial group cancer differentials. Because of the complete lack of information relevant to SES represented among data bases of population-based tumor registries, all of the studies in this field are ecological with respect to socioeconomic exposure measurement. Aggregate SES mea-

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asures, based upon geographic areas such as census tracts, have been used to characterize the individual's exposure: The vast majority of this extant research (90%) has focused upon income central tendency (e.g., census tract median income or some more complex measure which includes median income) and found it for example to be inversely associated with cancer incidence among both blacks and whites for sites with demonstrated greater incidence among blacks such as lung, stomach and cervix uteri.^{1,2}

We concur with others who have recently cautioned against necessarily viewing ecological inferences as suspect and individual ones correct,^{3,4} and we do not assume that ecological models are substitutes for individual-level ones. The above described body of research, which reviews more than 300 studies in this field, provides the means for making contextual inferences concerning the nature of underlying neighborhood living circumstances, thus, making a valuable contribution to our understanding of cancer occurrence and potential avenues for prevention, notwithstanding that of individual-level study.^{5,7} The following question may be asked of these previous ecological studies however: How much of the context in which people live or the socioeconomic environment have they accounted for in typically using only one data point to describe an economic distribution, for example, the median income to describe the incomes of approximately 4,000 people in a census tract? International studies of all-cause mortality have emphasized the dispersion and shape of economic distributions a la socioeconomic *inequality* or *relative deprivation*.^{8,12} Perhaps the best analog for census/cancer registry based study is prevalent impoverishment. Only two studies in this field have incorporated poverty status in their designs,^{3,13} and none have used the more liberal poverty criterion which this study does.

METHODS

The New York State (NYS) Cancer Registry provided access to data on the following cancer sites for this study: lung, stomach, cervix uteri, prostate, colon, rectum and breast. Among black or white adults, 41,978 such cases arose in Upstate NY metropolitan areas from 1979 to 1986 (1979—first year geocodes, based upon residence at the time of diagnosis, were accomplished on the data set and 1986—last year with complete data entry). To obtain adequate numbers of black adults, NY's four largest cities outside of New York City (NYC) as well as their surrounding county areas

TABLE 1

Description of Census Tract Poverty Status and the Association of Tract Poverty Variables with All (Blacks and Whites) Incident Cancer Cases

<i>Poverty Variable</i>	<i>Census Tract Proportion</i>		<i>Incident Cancer Cases^b With . . .</i>
	<i>Mean</i>	<i>SD^c</i>	
<i>Year</i>			<i>Partial Correlation^d</i>
<i>Persons Below 75% of the Poverty Level</i>			
1980	7.7	8.1	.385
1990	9.4	10.7	
<i>Persons Below the Poverty Level</i>			
1980	11.4	11.2	.403
1990	13.1	13.8	
<i>Persons Below 125% of the Poverty Level</i>			
1980	15.6	13.5	.410
1990	16.8	15.8	
<i>Persons Below 150% of the Poverty Level</i>			
1980	19.9	15.3	.435
1990	20.4	17.3	
<i>Persons Below 200% of the Poverty Level</i>			
1980	29.1	17.7	.457
1990	28.6	19.3	

Note. Poverty levels are based upon federally established criteria: annual income by household size (number of dependents).

^cSD = standard deviation.

^bSummary case counts (1979-1986) for those cancer sites with significantly greater incidence among blacks: lung, stomach, cervix uteri, and prostate.

^dTract population, median age, and gender (proportion female) controlled.

were included (Buffalo, Rochester, Syracuse and Albany). NYC was excluded because the error which intrudes in both numerator and denominator partitions of incidence estimation is at least twice that of Upstate NY. This study's data set was found to be comparable to SEER data on both microscopic confirmation (91.4%) and death certificate only enumeration (2.5%),¹⁴⁻¹⁶ and black and white cases were not found to differ substantively on these scores, respectively (90.2% and 91.5%) and (1.8% vs. 2.5%).

Cases were joined with census tracts ($n = 604$ tracts) through geocodes to extensive socioeconomic data:¹⁷⁻¹⁸ 5% of the cases are missing from this analysis as they lacked sufficient information for geocoding

TABLE 2

The Association of Near Poverty Status—Below 200% of the Federal Criterion—with Cancer Cumulative Incidence: Age-Standardized^a Rate Ratios (RRs) Among Black and White Subsamples (1979-1986)

Cancer Site	Cases		Blacks		Whites	
	Low / High Poverty Tracts ^b		RR	(95% CI) ^c	RR	(95% CI) ^c
Gender	Black	White				
Lung						
Female	70 / 216	3,079 / 416	1.79	(1.43,2.25)	1.95	(1.76,2.16)
Male	167 / 572	6,371 / 961	1.90	(1.65,2.19)	2.12	(1.98,2.27)
Stomach						
Female	15 / 45	603 / 91	1.72	(1.10,2.68)	1.99	(1.57,2.51)
Male	24 / 63	877 / 119	1.46	(0.99,2.15)	1.81	(1.50,2.19)
Cervix Uteri ^d	19 / 88	563 / 145	2.61	(1.73,3.94)	3.83	(3.26,4.50)
Prostate	111 / 332	4,715 / 535	1.35	(1.15,1.58)	1.35	(1.23,1.49)
Colon						
Female	53 / 160	3,626 / 423	1.62	(1.28,2.05)	1.48	(1.33,1.65)
Male	43 / 143	3,285 / 354	1.71	(1.31,2.24)	1.39	(1.24,1.55)
Rectum						
Female	14 / 46	1,294 / 163	1.92	(1.21,3.05)	1.64	(1.39,1.94)
Male	19 / 58	1,683 / 170	1.59	(1.04,2.44)	1.36	(1.16,1.60)
Breast (Female)	165 / 341	8,862 / 879	1.28	(1.09,1.51)	1.37	(1.28,1.47)

^aStandardized rate ratios used the combined (black-white), 1980-1990 (1982.6 algorithm), adult (25 years of age or older) population of this study's 604 census tracts as the standard: Annual at-risk population of 1,483,809—135,308 black adults and 1,348,501 whites. Direct adjustment was applied across the following five age strata: 25-44, 45-54, 55-64, 65-74 and 75 or older.

^bCensus tract poverty status: low poverty tracts ($n = 479$) are those with less than half (47.3%) their population's living below the 200% federal poverty threshold, whereas, more than half of the residents of high poverty tracts ($n = 125$) are below this criterion: Based upon a poverty quintile score break of 0-3 vs. 4 (i.e., the lowest four quintiles vs. the highest). This criterion cutoff was selected because it allows for adequate numbers of cases, particularly among blacks in low poverty tracts, and it also allows the same poverty exposure criterion to be used for black and white samples.

^cConfidence intervals are test-based.²⁰

^dInvasive.

(black and white cases were found to be exactly equivalent on this score).^{1,19} Before proceeding with this study's analysis, the validity of the data set was further assessed by systematically replicating the findings of previous related research with it: 1) comparison of black and white samples on site-specific cancer incidence and 2) the association of SES (median income)

with cancer incidence. All of these findings closely resembled those of previous studies.

RESULTS

Near Poverty Description

The continuum of poverty descriptors outlined in Table 1 suggest that the prevalence of poverty was stable during the 1980s in Upstate NY: approximately 10% of the population met the minimum federally established criterion in both 1980 and 1990, while nearly 30% met a more liberal criterion of two-fold the minimal poverty level. The following example may serve to put this description into a more practical context. In 1980 the minimum poverty threshold for a household with two adults and one child was an annual income of \$6,150. Even two-fold this minimum standard would make for a difficult life for most families of three. The partial correlations listed in Table 1 are also suggestive of the greater predictive power of more liberal (persons below 200% of the poverty level = near poverty) versus conservative poverty criteria. No previous study in this field has used the former criterion—this one will. This represents a new variable in the field of social epidemiology, and it seems that by its inclusion of those who are poor as well as those who are near poor, it may be a better predictor of cancer occurrence.

Near Poverty Status and Cancer Incidence

The cumulative incidence data displayed in Table 2 suggests that the contextual variable of near poverty status is directly associated with the incidence of all of this study's cancer sites. For example, the lung cancer rate ratio of 1.79 found among black females (see the top line of Table 2) is interpretable as follows: the rate of lung cancer among those black women who live in high poverty areas—census tracts where more than 50% of the residents are poor or near poor, that is, living below 200% of the federally established poverty threshold—is approximately twice that found among black women living in other, lower poverty areas. It also appears that the strength of the associations are similar among blacks and whites for each site. However, many more blacks (65.5%) as compared with whites (9.7%) were exposed in 1980 to the attendant health risks of living in high near impoverishment areas, that is, census tracts assigned to the highest quintile on proportion of persons living below 200% of the poverty level; prevalence ratio [PR] = 6.75 (95% CI: 5.07, 3.99). This ratio of prevalent expo-

sure seems to have been maintained throughout the decade—1990, $PR = 6.55 (4.94, 8.65)$.

DISCUSSION

This study replicates many others in finding that the context or area in which people live is greatly implicated in their health. Specifically, after having defined one-fifth of the census tracts in Upstate NY metropolitan areas as near poor—including the poor as well as those with incomes up to twice the federally established poverty criterion—such impoverishment was found to be directly associated with cancer incidence. Perhaps of most interest, consistent direct poverty-cancer associations were observed across sites, including those with previously known SES-cancer associations (lung, stomach and cervix uteri), those with equivocal ones (prostate, colon and rectum) and even for breast cancer which has been consistently found to be associated with other ecological SES measures in the opposite direction as that found in this study.

This study's cumulative incidence design is potentially limited in a number of ways as compared to an incidence density design. Potential problems pertain to numerator data, denominator data and the direction of the hypothesized effect. As for numerators, black cases did not differ substantially from white ones on the proportion which were enumerated on the basis of death certificate information only. Potential denominator problems related to census undercounts are most salient among black males. This study found the rate ratio of prostate cancer due to near impoverishment exposure among blacks to be 1.35. Adjusting for an extreme, though plausible scenario (i.e., an overall undercount of 8.0% and a four times greater undercount among the high poverty group as compared to the low one),²¹⁻²² a rate ratio of 1.31 is estimated. As expected, this study's rate ratios among blacks are probably overestimates of true population parameters, but not grossly so. Finally, the alternative directional hypothesis, that is, that cancer occurrence causes SES change, is not thought to be a compelling explanation for the following reasons: information on residence was abstracted at the time of diagnosis and five and ten year mobility patterns have not been found to be associated with site-specific cancer incidence.^{1,23}

It ought to be recalled here, that this study's central suggested inference is an ecological one, and does not necessarily compete with any extant individual-level inferences, be they biological, psychological or behavioral. It does imply however, that for each cancer site investigated

among both blacks and whites, at least one component cause of at least one sufficient cause is contextual, that is, that living in poor to near poor areas is a cancer risk factor. In other words, it is acknowledged that prevalent neighborhood impoverishment and individual lifestyle factors are very much interwoven, and so policies which address the issue of inner-city poverty may not be expected to completely solve the problem of racial group cancer differentials. However, it may be expected that intervention at this macro-level will be centrally important in eventually solving the problem.

This study's findings also point toward ecological action, again, individual-level preventive efforts notwithstanding—political or group action which addresses the needs of at-risk *areas* is called for. Approximately two-thirds of the at-risk census tracts defined by this study are inner city, predominantly black neighborhoods. Most of the remainder (up to 94%) are directly adjacent to this urban ghetto core. Though it may sound crass in today's oft heard call for color-blind legislation, it may also be instructive for policy makers desiring to build coalitions to note that any preventive efforts directed at the elimination of impoverishment and its consequences are also likely to greatly benefit whites. For example, if a hypothetical direct causal link between poverty and cancer were known and a hypothetical program eliminated 50% of the problem, even though blacks in a relative sense suffer far more from the experience of poverty, in an absolute sense, three-quarters of the prevented cancer cases would be expected among whites.

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