MORTALITY DIFFERENTIALS AMONG SOCIOECONOMIC STRATA IN BALTIMORE, 1960 and 1973.

Monroe Lerner and Richard N. Stutz

The Johns Hopkins University

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Did the traditional mortality differentials among socioeconomic strata in this country, still existing in 1960, narrow during the subsequent decade and in the early 1970's? There is some evidence that these differentials had been narrowing for some years prior to that time, at least up to 1957 (Lerner and Anderson, 1963, pp. 122-130), perhaps as a consequence of changing disease patterns and improving social and economic conditions in this country generally. However, this is by no means definitively established, and in one study of the trend of mortality differentials in the Chicago metropolitan area from 1930 through 1960 very little convergence among socioeconomic strata in overall mortality and life expectancy at birth was found, although the study reported very substantial convergence in infant mortality (Kitagawa and Hauser, 1973, pp. 158-159). The anti-poverty and other social welfare programs in effect during the latter part of the 1960's had in part been aimed at narrowing the gap in health conditions between the poor and non-poor, initiating this convergence if it had not taken place earlier and continuing it if it had, but little hard data exist about whether the intended effect did in fact take place.

This paper is the first preliminary report of one section of a larger study addressed to this overall question. It presents data on mortality differentials among three socioeconomic strata and six sub-strata in Baltimore at two points in time, 1960 and 1973, using census tracts grouped into strata and sub-strata as the units of analysis. The data on which this study is based have generously been made available to the authors by officials of the Baltimore City Health Department.† It seems quite possible that other localities and/or political jurisdictions have similar or equivalent data available for study, but that researchers have not yet taken advantage of this opportunity.

The Tayback study of 1950 data.

Baltimore was divided into census tracts some years ago with the consequence that information on the social and economic characteristics of the city's population by tract has been available since 1950 from the three Decennial Censuses. Using 1950 Census data, with tracts classified by median rental, Tayback studied differences in mortality and life expectancy among five economic strata of the city's population for 1949-51 (Tayback, 1957). He found a substantial and very consistent differential among the various strata of the white population in both mortality and life expectancy; for example, life expectancy at birth for the highest economic fifth exceeded the comparable figure for the lowest by 6.25 years. This differential was evident for the total population of white persons and for each sex within this population. He also found a very substantial differential between the mortality rates of the nonwhite and white populations in the city, with rates for the total nonwhite population substantially higher than the comparable rates of even the lowest economic fifth of the white population; this was true across the board, e.g., for the total population (all ages), for each sex, and for all age-groups except the oldest, i.e., ages 75 and above. A comparable analysis by economic strata for the nonwhite population only was not presented in Tayback's report, possibly because these were too few nonwhites residing in any tracts but those constituting the lower economic fifths.

Methods.

For the present study, Baltimore was first divided into three major socioeconomic strata. The city's 200 census tracts in 1970 were arrayed by median family income as reported in the 1970 Census; the 66 tracts falling into the bottom one-third of this array--low-income tracts--were designated as a major socioeconomic stratum and, because census tracts are roughly similar in number of residents, the population residing in this major stratum represented about one-third of the total population of the city. Next the remaining 134 tracts were again arrayed, but this time on the basis of occupational composition, i.e., the occupations of employed persons aged 16 and over. The 67 tracts among these 134 with the largest proportions of persons in a combined group of white-collar middle class occupational categories were classified as a second major socioeconomic stratum; the occupational categories were: professional, technical, and kindred workers; managers and administrators; sales workers; and clerical and kindred workers. The remaining 67 census tracts constituted a major socioeconomic stratum of the tracts with the highest proportions of persons in blue-collar working class occupations; the occupational categories included here were craftsmen, foremen, and kindred workers; operatives except on transport equipment; transport equipment operatives; laborers; service workers; and private household workers.

†Grateful acknowledgement for supplying these data and thereby making this study possible is hereby extended to Mr. John J. Sweitzer, Director, and Mr. Sheldon Baylin, both of the Bureau of Biostatistics, Baltimore City Health Department.

For more detailed observation, each of the three major socioeconomic strata was in turn split into two sub-strata, as follows. The white-collar middle class stratum (consisting of 67 tracts) was separated into a sub-stratum of the 33 tracts with the highest proportions in a combined grouping of professional, technical, and kindred and managerial and administrative occupations; this was designated as Sub-stratum I. Sub-stratum II consisted of the 34 tracts within this major stratum with highest proportions in a combined grouping of sales and clerical and kindred occupations. The blue-collar working class stratum (67 tracts) was similarly split into a sub-stratum (III) consisting of the 33 tracts with the highest proportions of persons in skilled and semi-skilled occupations (i.e., craftsmen, foremen, and kindred workers; operatives except transport; and transport equipment operatives), while sub-stratum IV consisted of the 34 tracts with highest proportions in generally unskilled occupations (laborer, service, and private household occupations). Finally, the low-income major stratum was simply split down the middle by income to comprise Sub-strata V and VI, with VI having the lowest median family incomes.

The designation of sub-stratum for each census tract in 1970 was also used for its designation in 1960 wherever this was possible. However, the number of tracts in 1960 was only 167; for the 1970 census, this number had been increased by Census authorities to 200 by dividing some of the larger tracts into 2 or more smaller units. Those divided were the tracts experiencing the greatest population increase during the intercensal period; many of these were in Sub-stratum II. In nearly all instances where this had been done, the two or more 1970 tracts derived from a single 1960 tract were classified by us as in the same sub-stratum in 1970 as their larger tract of origin would have been classified by us in 1960, so that assigning them to a sub-stratum for 1960 was not difficult.

Population for 1973 for each sub-stratum by race, age, and sex was estimated from 1970 Census figures by census tract and from 1973 overall Baltimore City estimates by race, age, and sex prepared by the Health Department. The assumption was made that the increases estimated by the Health Department as occurring in the city's total nonwhite population between 1970 and 1973 (22,630 persons) and the corresponding decreases in the total white population (46,580 persons) occurred in each sub-stratum in proportion to the sub-stratum's change in percent of the total within each racial group between 1960 and 1970. The additional assumption was made that the age and sex composition of the population for each racial group within each sub-stratum in 1973 corresponded to its composition in 1970 according to Census figures.

Racial composition of the sub-strata, 1960 and 1973.

As in many other major cities in this nation during the 1960's, the proportion nonwhite in Baltimore City's population increased, in this instance from just over one-third (36.5 percent) to slightly over one-half (52.6 percent). These data are shown in Table I. Some considerable shifts occurred in racial composition among the sub-strata. For example, the number of whites increased in Sub-stratum II, but decreased substantially in all other strata; the number of non-whites decreased in Sub-strata III and VI, but increased in the remaining four sub-strata. Considering major strata only, an increase occurred in the percent nonwhite in all three strata. The basic pattern remained, however, in that the white-collar middle-class stratum, predominantly white in 1960, was still so in 1973, while correspondingly the low-income stratum, predominantly nonwhite in 1960, was also nonwhite in 1973. However, a shift occurred in the racial composition of the blue-collar working class stratum; about 60 percent white in 1960, this stratum had become about 60 percent nonwhite by 1973.

Mortality patterns: overall.

For Baltimore City as a whole, as Table II shows, the age-adjusted mortality rate† decreased substantially from 1960 to 1973, i.e., from 970 per 100,000 population to 842, a decrease of about 13 percent over this 13-year period. In 1960 a very substantial differential among the sub-strata was evident; from a low age-adjusted rate of 636 in Sub-stratum II, the rate rose slowly for III and IV, more rapidly for V, and it rose very sharply to 1,722 for VI. The rate for sub-stratum VI was about 2.7 times as high as the rate for II. The mortality rate in Sub-stratum I exceeded the rate in II by over 40 percent, but it exceeded the rates in Sub-strata III and IV as well; because of these relatively high rates in I and the steepness of the rise to V and especially to VI, the curve formed by the rates was more nearly U-shaped than linear, but it was a substantially unbalanced U-shape, with a higher line on the right.

In 1973 the general unbalanced U-shape pattern of the curve remained relatively unchanged from the 1960 pattern except that it was somewhat flatter at the extremes. Again sub-stratum II had the lowest age-adjusted mortality rate of all, 591 per 100,000. Again the rise was relatively slow from Sub-stratum II to III and IV, but it was somewhat less rapid this time to V and VI.

Again the rate in Sub-stratum I exceeded that in II by a substantial although somewhat smaller margin (about 37 percent this time), and again it exceeded the rate in Sub-stratum III but this time it was almost identical to the rate in IV. The rate in the highest sub-stratum (VI, with a rate of 1,503) was only about 2.5 times the rate in the lowest sub-stratum. The

†Adjusted to the U.S. population of 1940. All rates shown here are preliminary; it is expected that final rates may differ slightly from those shown, but that the basic patterns discussed here should remain generally unchanged.

declines in rates from 1960 to 1973 in Sub-strata V, VI and I were about 16, 14, and 11 percent, respectively, while the comparable decline in Sub-stratum II was only about 7 percent, in IV about 6 percent, and in Sub-stratum III the rate actually increased slightly.

The unbalanced U-shaped curves emerging in both years with six sub-strata are no longer evident when the six are compressed into three major strata as the unit of analysis, with age-adjusted rates in the sub-strata combined in weights proportional to population to form the rates for the major strata. When this is done the mortality rates in the major white-collar stratum are quite close to those in the major blue-collar stratum while the rates for the major low-income stratum are much higher. (The rates are: 1960--white-collar 805, blue-collar 811, and low-income 1,452; 1973--white-collar 689, blue-collar 791, and low-income 1,229.) Especially in 1973 the curve is more nearly linear.

Mortality patterns: by age.

Considering the city as a whole, mortality rates decreased for 7 of the 11 age-groups shown in the table. Among the age-groups for which increases were recorded, these increases were greatest in relative terms at ages 20-24 (154 percent), followed in descending order of relative magnitude by ages 15-19 (113 percent) and 25-34 (66 percent), with even a slight increase of less than 1 percent at ages 45-54. The decreases, in turn, were greatest at 0-4 (48 percent), 5-9 (35 percent), and 75 and over (26 percent).

The unbalanced U-shaped pattern evident in both years for age-adjusted rates was clearest at the middle and upper ages. Most often the rates at these ages were lowest in Sub-stratum II, but in some instances the bottom point of the curve was in Sub-stratum III or even IV. In almost all instances the rates were substantially higher for Sub-strata V and VI than for the other sub-strata. There seemed to be relatively little change in this pattern between 1960 and 1973.

At ages 0-4 a fairly pronounced linearity was evident in 1960 with a sharp slope (an average 19 percent increase from sub-stratum to sub-stratum) but by 1973 there was a definite decrease in slope (only an average 6 percent increase from sub-stratum to sub-stratum). Little change was evident at ages 5-9 and 10-14 between 1960 and 1973 other than the overall improvement in rates in the former age-group.

Mortality patterns: by race and age.

Overall, considering age-adjusted rates only, mortality declined substantially for both racial groups between 1960 and 1973, by 12 percent for whites and 17 percent for nonwhites. The differential between the races narrowed somewhat; in 1960 the rate for nonwhites exceeded that for whites by 33 percent, in 1973 by only 24 percent. By age, in 1960 the rates for nonwhites had exceeded the comparable rates for whites in 8 of the 11 age-groups shown in Table III (the exceptions were 5-9, 10-14, and 75 and over), but by 1973 the relative excess had decreased in 7 of the 8 (the exception was 25-34). For both racial groups alike, mortality rates increased between 1960 and 1973 at 15-19 and 20-24. In addition, however, increases were also recorded for nonwhites at ages 10-14 and 24-34 and for whites at 35-44 and 45-54.

To have sufficiently large cell sizes in each age-group for comparisons by race, the six sub-strata were compressed into four for each racial group: IV, V, and VI for whites and I, II, and III for nonwhites were each treated as one sub-stratum. Analyzed in this way, the unbalanced U-shaped pattern describing age-adjusted rates for the total population in both years was also found to be characteristic of age-adjusted rates for each race separately in both years; however, between 1960 and 1973 a slight suggestion of a flattening in slope was evident for only the nonwhite population. By age, the unbalanced U-shaped pattern most evident at the middle and upper ages when total populations in both years (not by race) were considered was again most evident at these ages for both racial groups alike, with little evidence of any change in this pattern between 1960 and 1973.

Discussion.

Apart from the fact that the rates shown in this report are to be understood as preliminary, as indicated earlier, a major limitation to this presentation is that the mortality data shown here represent only one year's experience in both 1960 and 1973. It is hoped that it will be possible to obtain Baltimore City's mortality data for 1959 and 1961, and for 1972 and 1974, so that cell size might be larger and any idiosyncrasies peculiar to the years under consideration might be removed. Also, it is hoped that infant mortality data comparable to that shown here will be available, as well as overall and infant mortality data for Baltimore County and other parts of the Baltimore Metropolitan Area. However, further analyses of the presently available data are planned by race, sex, and major causes of death; also, census tracts will be ordered on a number of different bases and comparisons will be made with Tayback's 1950 data for Baltimore City.

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TABLE I

SELECTED CHARACTERISTICS OF THE MAJOR SOCIOECONOMIC STRATA AND SUB-STRATA BALTIMORE, 1960 and 1973.*

Major Socioeconomic Strata And Sub-Strata	1960						1973					
	Tracts	Population, Total Number	Percent	White	Nonwhite	Percent Nonwhite	Tracts	Population, Total Number	Percent	White	Nonwhite	Percent Nonwhite
Baltimore City	167	980,690	100.0	623,150	357,540	36.5	200	926,160	100.0	439,270	486,890	52.6
White-Collar Middle Class	45	299,682	30.6	283,353	16,329	5.4	67	303,794	32.8	253,547	50,247	16.5
I	29	183,679	18.7	167,702	15,977	8.7	33	135,973	14.7	97,606	38,367	28.2
II	16	116,003	11.8	115,651	352	0.3	34	167,821	18.1	155,941	11,880	7.1
Blue-Collar Working Class	58	326,878	33.3	232,743	94,135	28.8	67	333,282	36.0	132,440	200,842	60.2
III	29	146,879	15.0	131,209	15,670	10.7	33	112,892	12.2	111,091	1,801	1.6
IV	29	179,999	18.4	101,534	78,465	43.6	34	220,390	23.8	21,349	199,041	90.3
Low-Income	64	354,130	36.1	107,054	247,076	69.8	66	289,084	31.2	53,283	235,801	81.6
V	32	171,330	17.5	78,109	93,221	54.4	33	155,375	16.8	43,488	111,887	72.0
VI	32	182,800	18.6	28,945	153,855	84.2	33	133,709	14.4	9,795	123,914	92.7

*Figures for the total city (all strata combined), overall and by race, are based on 1960 and 1970 Census figures revised by the Baltimore City Health Department to account for underenumeration in each Census and distributed proportionately among the sub-strata by race. Also, all estimates are as of July 1 for each year. Estimates for 1973 were derived by linear extrapolation of trends from 1960 to 1970.

TABLE II

PRELIMINARY MORTALITY RATES* BY AGE

TOTAL AND BY SUB-STRATA, BALTIMORE CITY, 1960 and 1973.

Year and Sub-Stratum	All ages Crude	All ages Adjusted**	0-4	5-9	10-14	15-19	20-24	25-34	35-44	45-54	55-64	65-74	75+
1960													
Baltimore City	1,167	970	820	57	46	60	92	219	461	1,075	2,375	4,853	11,436
I	1,284	912	560	94	35	48	91	167	332	879	2,091	4,431	13,647
II	929	636	545	22	44	25	73	105	255	614	1,689	3,075	8,380
III	1,013	747	774	91	78	40	11	173	380	835	1,905	3,738	7,577
IV	1,130	863	641	36	41	74	101	129	372	977	2,116	5,369	12,960
V	1,280	1,163	1,023	31	42	95	115	280	617	1,380	2,798	6,195	11,813
VI	1,577	1,722	1,383	79	57	81	238	446	887	2,061	4,582	8,710	17,058
1973													
Baltimore City	1,142	842	427	37	37	128	234	244	409	1,084	2,096	4,261	8,489
I	1,370	810	423	18	59	76	202	233	336	703	1,907	4,311	10,692
II	1,108	591	294	33	31	76	124	118	330	598	1,391	3,185	7,116
III	1,306	756	569	64	35	161	225	189	429	1,059	1,968	3,370	6,539
IV	797	809	289	9	12	96	232	253	418	1,065	1,905	4,025	9,058
V	1,128	993	526	72	24	202	277	233	552	1,330	2,651	5,129	8,310
VI	1,418	1,503	588	49	85	173	335	455	1,067	2,039	3,665	8,202	12,183

*Per 100,000 population.

**To the age-distribution of the U.S. Population, 1940.

TABLE III

PRELIMINARY MORTALITY RATES† BY RACE AND BY AGE
TOTAL AND BY SUB-STRATA, BALTIMORE CITY, 1960 and 1973.

Year, Race, and Sub-Stratum	All ages Crude	All ages Adjusted††	0-4	5-9	10-14	15-19	20-24	25-34	35-44	45-54	55-64	65-74	75+
1960 - White													
Baltimore City	1,284	877	601	70	54	44	58	157	349	892	2,123	4,653	11,683
I	1,296	865	440	99	38	35	10	171	335	835	2,057	4,308	13,334
II	929	635	547	22	44	25	73	105	249	615	1,692	3,078	8,337
III	1,073	757	779	87	78	45	--	152	377	882	1,921	3,843	7,696
IV-VI	1,693	1,291	700	67	62	64	129	191	428	1,161	2,671	6,588	22,178
1960 - Nonwhite													
Baltimore City	964	1,159	1,062	42	35	88	144	302	658	1,496	3,115	5,739	10,050
I-III	815	918	1,072	86	35	92	50	228	372	900	2,193	4,626	14,925
IV	657	655	824	23	29	113	102	167	495	1,061	1,769	3,417	1,842
V	914	1,067	1,070	20	24	95	103	321	748	1,568	2,887	5,112	6,946
VI	1,395	1,681	1,433	65	52	86	239	446	901	2,129	4,807	8,710	13,482
1973 - White													
Baltimore City	1,474	771	393	43	37	110	194	148	387	914	1,914	3,868	8,878
I	1,642	800	367	30	41	80	189	180	305	690	1,946	4,268	11,193
II	1,140	572	208	28	26	67	109	78	311	581	1,385	3,210	7,154
III	1,281	729	507	66	36	129	192	179	417	1,031	1,882	3,327	6,465
IV-VI	2,242	1,207	641	59	54	209	380	204	607	1,732	3,027	5,515	13,013
1973 - Nonwhite													
Baltimore City	843	958	446	33	38	140	261	328	611	1,273	2,397	5,227	7,289
I-III	755	857	717	17	81	143	293	436	452	860	2,033	4,291	6,660
IV	564	641	259	9	13	80	219	232	400	952	1,701	3,244	4,601
V	880	1,000	500	73	23	208	243	281	590	1,174	2,596	5,891	7,515
VI	1,312	1,495	592	44	75	175	338	484	1,048	2,077	3,536	8,278	11,843

†Per 100,000 population.

††To the age-distribution of the U.S. Population, 1940.