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AMERICAN CHILD MORTALITY DIFFERENTIALS IN COMPARATIVE PERSPECTIVE

THE PATTERNS OF child mortality differences demonstrated in Chapters 3 and 4 are the outcomes of a complex array of factors, including the relative social and economic standings of different groups, differences in child-care practices, and the disparate disease environments in which the groups were located. In order to gain insight into the importance of these factors in fashioning the observed differentials in child mortality, it is useful to compare the American circumstances that we have described to those in other societies. For comparative purposes we have chosen to focus in this chapter on child mortality differentials in England and Wales in 1911 and in a set of eleven developing countries in the 1970s. Both comparisons rely upon data comparable to what was available in the United States in 1900: census or survey responses by women to questions on the number of children they had borne and the number of those children who had survived to the time of the census or survey. The broader, systemic factors that condition child mortality levels and differentials are usefully revealed by these comparisons.

Child Mortality Differentials in England and Wales in 1911

The Census of Marriage and Fertility of England and Wales in 1911 produced very extensive tabulations of children ever born and surviving among different groups (England and Wales 1923). Equivalent to the analytic scheme of Chapter 4, tabulations of child mortality are produced for married women with husband present by duration of marriage (Preston, Haines, and Pamuk 1981; Watterson 1986, 1988). No public-use sample of these data has been prepared, precluding the use of multivariate techniques. But the extensive basic tabulations permit comparisons with the U.S. across a number of dimensions. A similar inquiry was undertaken in the 1911 Census of Ireland, although the scope of published tabulations was much more limited (Great Britain 1913a).

A basic contrast between England and Wales in 1911 and the United States in 1900 is their degrees of urbanization. While a majority of the American population was still living in rural areas in 1900, England and Wales, the first area to industrialize and urbanize, had 78 percent of its population living in urban areas by 1911 (England and Wales 1914: Table 13). Ireland was, of course, predominantly rural. As late as 1929, 73 percent of the Irish population lived in rural areas (Knodel and van de Walle 1979: Table 1). One might expect that the English results would look more like the results for the urban United States in Chapter 4 than those for the rural or total population. Recall that urban areas showed a somewhat higher degree of differentiation in child mortality by husband's occupation, as well as a larger penalty for women who worked. As occupational structures diversified and sharpened in urban areas, labor-force activities seemed to become more closely associated with child mortality levels.

This expectation is realized in the English data. Table 5-1 presents the basic results. Because many of the published English data are limited to women below age 45 at the time of the census, we have restricted our analysis to woman married 0–14 years. The singulate mean age at marriage in England and Wales was relatively high, at 27.7, so that women of marital durations beyond 15 years who were below age 45 would have constituted an increasingly selective sample.[1] We use the marital-duration approach to estimating $q(x)$'s that was described in Chapter 2 (United Nations 1983a: ch. 3). Because the analysis of U.S. data used marital durations below 25 years and the English results used durations below 15 years, the latter will apply to a date that is somewhat closer to the census than will the date in the U.S.

It should be noted that the mortality levels estimated through these indirect methods are not far out of line with the national figures supplied by England and Wales's excellent vital registration system. For example, the value of $q(5)$ for 1901–10 in the vital registration system is .192 (Table 2.3). The value of $q(5)$ for 1905 estimated from the marital-duration model based on women married 10–14 years is .174. It is likely that restriction of the marital-duration approach to women only once married with husband present has reduced census levels of mortality somewhat relative to the national average.

Rural/urban differences similar to those in the U.S. are revealed in England and Wales. Rural districts had the lowest child mortality. Urban areas as a whole had mortality that was 33 percent higher than rural areas, compared to the urban excess of 22 percent for the United States (from Table 3.1). London, however, exhibited mortality below

TABLE 5.1
Child Mortality Index in Various Social Categories: England and Wales, 1911

	Children ever born	*Years before census*	*Child mortality index*
Total	6,431,596	4.439	1.0000
Number of rooms			
1	82,676	3.728	1.8960
2	570,755	4.015	1.3457
3	1,118,101	4.301	1.1192
4	1,821,824	4.436	1.0395
5	1,274,477	4.485	.8647
6	678,053	4.467	.7866
7	231,254	4.550	.6676
8	121,379	4.654	.6185
9	64,062	4.666	.5624
10+	113,463	4.763	.5091
Residence			
London	767,314	4.334	1.0031
County boroughs	1,965.311	4.371	1.1584
Other urban districts	2,258,929	4.373	.9740
Rural districts	1,308,677	4.382	.7884
North	2,231,971	4.363	1.1562
County boroughs	1,115,206	4.365	1.2324
Other urban districts	804,464	4.354	1.1278
Rural districts	312,301	4.372	.9571
Midlands	1,991,786	4.392	.9130
County boroughs	583,428	4.393	1.1144
Other urban districts	863,158	4.393	.8820
Rural districts	545,200	4.388	.7462
South	1,614,799	4.364	.8582
London	767,314	4.334	1.0031
County boroughs	179,824	4.366	.8613
Other urban districts	358,794	4.400	.7464
Rural districts	308,957	4.392	.6257
Wales	461,675	4.318	1.0705
County boroughs	86,853	4.313	1.1192
Other urban districts	232,513	4.298	1.1362
Rural districts	142,309	4.354	.9336
Wife's labor-force status			
Not employed	5,819,178	4.394	.9704
Employed	481,053	4.188	1.3140
Textiles	122,340	3.911	1.6788

TABLE 5.1 (*cont.*)

	Children ever born	*Years before census*	*Child mortality index*
Husband's social class			
Professional/higher white-collar	490,466	4.386	.6463
Merchant/lower white-collar	914,219	4.493	.8339
Skilled manual	1,581,055	4.437	.9498
Semi-skilled manual	1,124,770	4.449	.9498
Unskilled manual	1,210,256	4.536	1.2151
Textile workers	204,912	4.415	1.2001
Miners	715,593	4.344	1.2770
Agricultural Laborers	271,928	4.484	.7929
Place of birth			
Husband: E & W			
Wife: E & W	5,862,453	4.373	.9998
London	789,962	4.346	.9497
Great towns	1,873,345	4.325	1.1394
Urban counties	1,434,366	4.377	1.0051
Mixed counties	734,093	4.421	.9089
Rural counties	1,030,687	4.729	.8426
Outside E & W	147,123	4.332	.9570
Scotland	35,071	4.279	.8776
Ireland	38,209	4.319	1.0260
Husband: Scotland	57,705	4.381	.8403
Wife: Scotland	19,693	4.575	.7677
E & W	46,346	4.349	.8889
Husband: Ireland	77,675	4.307	1.1410
Wife: Ireland	21,172	4.406	1.1394
E & W	53,287	4.273	1.1479

Source: England and Wales 1923.

Note: Based upon children ever born and surviving to currently married women below age 45 who were married 0–14 years. All calculations are made using the indirect techniques in United Nations 1983: ch. 3. Coale and Demeny (1986) Model West is used throughout. Only the marital-duration model is estimated. Years before census refers to the number of years prior to the census (April 2/3, 1911) to which the mortality estimate pertains. The index is the ratio of actual to expected child deaths to all women in a category. Social class of husband is defined as professional and higher white-collar; merchants, farmers and lower white-collar; skilled manual workers; semi-skilled manual workers; unskilled manual workers; textile workers; miners; and agricultural laborers.

the county boroughs, which included most of the other large industrial and commercial cites such as Liverpool, Birmingham, Manchester, Sheffield, Newcastle-upon-Tyne, Leeds, Leicester, and Coventry. Institutional changes in the provision of public health and sanitation appear to have been introduced sooner in London than in other large cities (Daley and Benjamin 1964; Wohl 1983:64–66; Szreter 1988). By 1906 or so, London had achieved childhood mortality levels comparable to those in small cities ("other urban districts;" Table 5.1). This achievement appears even more impressive when it is recognized that by 1911 London was the world's largest city, with a population of 7.2 million. The next largest European city was Paris, with a population of only 2.9 million. New York City had 4.8 million inhabitants by 1910. It is noteworthy that London's relative advantage was substantially greater for children of women married 0–4 years than for those of women married 10–14 years, implying an unusually rapid fall in mortality. In fact, London's level of $q(2)$, based on women married 0–4 years, was below the national average. Nevertheless, rural districts in England and Wales, as in the U.S., clearly had the best experience in child survival.

Rural/urban difference persisted within broad regions, but the levels varied considerably. The North region, which included some of the largest industrial and commercial cities (Liverpool, Manchester, Newcastle-upon-Tyne) had the least favorable childhood mortality experience in the nation (see also Woods et al. 1988). These urban areas were often tardy in implementing effective public-health improvements. For example, Wohl (1983:112) reports that "Manchester gained control of the Manchester and Salford Waterworks Co. in 1851 and yet as late as 1904 only one house in fourteen had water laid on." The Midlands, also relatively urban and industrial (with cities such as Birmingham, Leeds, Bradford, and Leicester), nevertheless showed more favorable childhood mortality, largely traced to the much better experience of rural areas and smaller cities. A clear north/south mortality gradient existed, with the more agrarian and less industrial South region (excepting, of course, London, which itself had made substantial progress) having had the best childhood mortality levels. Wales had some of the least healthy industrial centers and also a history of rural poverty and neglect. It also had high childhood mortality, very similar to the North region.

Child mortality levels were strikingly differentiated by husband's occupational level. As the husband's social class declines from professional and higher white-collar to unskilled manual workers, there is a clear monotonic rise in the mortality index. Among the special groups separately enumerated, the highly urbanized groups of min-

ers and textile workers had considerably higher childhood mortality than the largely rural agricultural laborers.[2]

Women who were employed had dramatically higher mortality among their children than did women who did not work (see also Dyehouse 1979). Levels were especially elevated among women working in the textile industry, which tended to be concentrated in the high mortality cities of the North and Midlands. Labor-force activity among married women (with husband present) was not common in England and Wales. Only 10 percent of women married 0–14 years were employed outside the home. As in the U.S., the mortality differential may have been overstated by a process of reverse causation, whereby women with a dead child might be more likely to work.

Table 5.1 reveals a clear monotonic gradient of child mortality according to the number of rooms in the house. The effect was strong: the child mortality index for families living in one room was almost four times as great as that for couples living in accommodations with 10 or more rooms. This variable may be functioning largely as a proxy for general social standing, but it also is expected to have a direct effect on mortality through congestion and transmission of communicable diseases. It is probably one of the most important pathways by which economic circumstances influence child mortality. That it is not simply an indicator of economic status is implied by the Woodbury study of American cities. The risk of infant death for those with two or more people per room was 2.5 times that of those with fewer than one person per room, and the differential declined only to 2.0 when father's earnings were controlled (Woodbury 1925:129–30).

The 1911 English Census also presents some tabulations by place of birth of husband and wife, which is highly correlated with place of current residence. The same curvilinear pattern of mortality by city size is evident. There is an interesting hint of an intergenerational effect of being London-born. Children born to women who were themselves born in London had in all cases lower mortality than the national average, and lower mortality than children born to "current" London residents. A similar intergenerational advantage of urban birth was demonstrated in a United Nations (1985) study of contemporary developing countries.

Irish immigrants to England and Wales experienced elevated child mortality, as in the United States. Although the Irish fared badly in both the U.S. and England and Wales, they did surprisingly well in Ireland itself. Table 5.2 presents calculations of q(a) values for women of marital durations 0–4 years through 30–34 years for the whole of Ireland and for urban and rural places within Ireland. In particular,

TABLE 5.2

Child Mortality and Fertility by Marital Duration and Place of Residence: Ireland, 1911

	Marital Duration						
	0–4 years	*5–9 years*	*10–14 years*	*15–19 years*	*20–24 years*	*25–29 years*	*30–34 years*
Average Parity							
Ireland	0.9804	2.8051	4.1673	5.1981	5.8735	6.4185	6.7418
Six county boroughs	0.9545	2.6493	3.9834	5.0924	5.8436	6.4041	6.7893
Dublin	0.9468	2.6175	3.9250	4.9069	5.6053	6.0595	6.4876
Belfast	0.9350	2.5604	3.8220	4.9294	5.7272	6.2414	6.6207
Ireland less 6 boroughs	0.9887	2.8540	4.2248	5.2298	5.8816	6.4219	6.7327
	$q(2)$	$q(3)$	$q(5)$	$q(10)$	$q(15)$	$q(20)$	$q(25)$
Child mortality: $q(a)$							
Ireland	0.09806	0.11431	0.14147	0.16327	0.18128	0.19799	0.21264
Six county boroughs	0.13141	0.16486	0.20580	0.23478	0.26893	0.29209	0.31088
Dublin	0.12640	0.16758	0.21096	0.24521	0.27750	0.29643	0.32282
Belfast	0.12392	0.15169	0.18887	0.21190	0.25347	0.26859	0.28309
Ireland less 6 boroughs	0.08773	0.09950	0.12261	0.14260	0.15765	0.17572	0.19373
Years ago							
Ireland	1.56	3.28	5.83	8.70	11.71	14.70	17.46
Six county boroughs	1.30	3.33	5.83	8.56	11.48	14.52	17.35
Dublin	1.30	3.34	5.84	8.58	11.52	14.56	17.39
Belfast	1.58	3.36	5.87	8.62	11.57	14.64	17.47
Ireland less 6 boroughs	1.28	3.27	5.84	8.74	11.78	14.76	17.49
Implied level (Model West)							
Ireland	16.75	16.24	15.33	14.92	14.57	14.51	14.73
Six county boroughs	14.66	13.50	12.38	11.96	11.18	11.05	11.30
Dublin	14.96	13.36	12.17	11.54	10.85	10.90	10.90
Belfast	15.12	14.15	13.10	12.85	11.77	11.91	12.25
Ireland less 6 boroughs	17.44	17.12	16.32	15.89	15.62	15.43	15.45
Children ever born							
Ireland	87,489	255,500	338,609	350,240	337,156	290,932	271,485
Six county boroughs	20,567	57,718	77,004	78,962	71,829	55,748	43,791
Dublin	9,057	25,570	33,343	32,847	28,671	22,899	18,386
Belfast	9,518	25,650	34,669	36,142	33,544	24,616	18,922
Ireland less 6 boroughs	66,922	197,782	261,605	271,278	265,327	235,184	227,694

Source: Great Britain 1913a: lxiii–lxv, Table 65.

Note: $q(a)$ is the probability of dying between birth and exact age a. All calculations are made using the indirect techniques in United Nations 1983a: ch. 3. Coale and Demeny (1966) Model West is used throughout. Only the marital-duration model is estimated. Years ago refers to the number of years prior to the census (April 2/3, 1911). The six county boroughs are Dublin, Belfast, Cork, Londonderry, Limerick, and Waterford. The figures for Dublin are for the Dublin Registration Area (Dublin County Borough and Rathmines, Rathgar, Pembroke, Blackrock and Kingston Urban District).

census data are presented for Dublin, Belfast, six county boroughs (urban areas that also included Dublin and Belfast), and Ireland without these urban places (i.e., essentially rural and small-town Ireland).[3] These retrospective data from the 1911 census confirm the suggestion from Irish vital statistics (Table 2.3) that Ireland had unusually favorable child mortality. The Irish advantage was a cause of some astonishment among British analysts (Brend 1917). The advantage appears entirely attributable to Ireland's highly rural character. If the population of Ireland had been 78 percent urban, as in England and Wales, then its value of $q(5)$ would have been .187, slightly higher than England and Wales's value of .174.[4] Ireland apparently had somewhat lower rural mortality than England and Wales and somewhat higher urban mortality.

Inequality and Childhood Mortality: The United States in 1900 and England and Wales in 1911

There has been a resurgence of interest among economists, sociologists, and historians in social and economic inequality in the United States and Great Britain (see, for example, Phelps Brown 1977: ch. 1; Williamson and Lindert 1980; Lebergott 1976; Williamson 1982b, 1985; Lindert 1983). Much of the effort has been devoted to studying the causes of inequality: the distribution of income, earnings, wages, and wealth. Another approach, used in the standard-of-living debate for industrializing Britain, has studied outcomes (Taylor 1975: xvii–xviii, xxix–xxxvii). Among the outcomes, health and mortality have been used by a number of authors to characterize differences in well-being (Williamson 1982a; Fogel, Engerman, and Trussell 1982; J. R. Hollingsworth 1981; Kadin 1982; Preston, Haines, and Pamuk 1981; Pamuk 1985).

As the basic indicator of social class, special interest is attached to indexes of inequality by husband's occupation. Table 5.3 presents the mortality index for husband's occupation in United States in 1900 and England and Wales in 1911, standardized to an all-occupation index of 100 in each case. Comparisons with vital statistics show the English occupational data to be highly reliable.[5] The first panel of Table 5.3 aggregates occupations into a modified version of the scheme used for the 1950 American census, and involves a distinction between occupation and industry. The 1900 American data are presented separately by race and nativity of women. The English data were mapped onto the American categories as well as was permitted by the detailed occupations published in the 1911 census. The second

TABLE 5.3
Child Mortality Differentials by Husband's Social Class: U.S., 1990, and England and Wales, 1911

	U.S., 1900					*England and Wales, 1911*
	Total	*White*[a]	*Native white*[a]	*Foreign white*[a]	*Black*[a]	*Total*
U.S. occupational classification, 1950: total	100	100	100	100	100	100
Professional, Technical	94	100	107	88	*b*	62
Agricultural (excludjng Laborers)	86	82	86	79	92	65
Agricultural Laborers	114	99	102	98	103	77
Managers, Officials, Proprietors	93	100	102	100	}	81
Clerical	91	94	97	94	} 58[b]	68
Sales	83	89	88	92	}	89
Craftsmen, Foremen	112	117	116	111	133	98
Operatives	104	107	113	91	113	117
Service Workers	100	101	106	87	94	84
Laborers	124	124	120	118	114	124
Miscellaneous	100	102	92	106	108	81
England and Wales classjfication 1911: total	100	100	100	100	100	100
Professional, Higher White-Collar	87	93	98	85	58	65
Farmers & Lower White-Collar	86	84	87	82	90	83
Skilled Manual Workers	112	118	121	107	115	95
Semi-skilled Manual Workers	114	114	110	110	128	100
Unskilled Manual Workers	123	123	120	116	114	122
Textile Workers	123	135	139	118	*	120
Miners	98	96	105	74	139	128
Agricultural Laborers & Related	115	100	105	95	103	79

Source: Sample of census enumerators' manuscripts, U.S., 1900; England and Wales 1923.

Note: The sample consists of currently marrjed women wjth husband present for whom an occupation class of husbands could be assigned. For the U.S., women are married 0–24 years, and jn England and Wales, 0–14 years. For calculation of the mortality index, see text.

[a] Relative to the U.S. index for all groups combined of 100, the index for whites was 94, for native whites 87, for forejgn-born whites 112, and for blacks 144.

[b] For U.S. blacks, the categorjes Professional, Technical; Managers, Officials, Proprietors; Clerical; and Sales were combined because of small cell sizes.

* Fewer than 40 children ever born.

panel of Table 5.3 presents the American and the English data aggregated into the eight categories of the English social classes used in the 1911 census. Both sets of aggregations are based upon 338 detailed occupational titles in the United States and 206 in England and Wales.

Table 5.3 suggests that social-class inequality in mortality was greater in England and Wales around 1907 than in the United States around 1895. First, using the English classification, we see that the range of mortality indexes is much greater in England and Wales

than in the United States. In particular, the professional and higher white-collar group was considerably less favored with respect to child mortality in the United States than in England and Wales. The relative position of unskilled manual workers was similar in the two countries, but miners showed the highest mortality level in England and no excess whatever in the United States.

The more favorable position of miners in the U.S. can be partly attributed to the greater likelihood in England and Wales than in the United States that coal and iron miners would live in urban areas. Of males aged 10 and over who were coal and iron miners and mine workers in England and Wales in 1911, 69.8 percent lived in urban districts (England and Wales 1914: Table 13). Among coal miners and mine workers in the sample used to calculate the American mortality indices in Table 5.3, only 29.1 percent were found in urban areas. American miners in urban areas with between 5,000 and 24,999 inhabitants had a child mortality index of 1.21, while those in rural areas had an index of .90. America's predominantly rural miners appear to reflect the mortality of their locale. British miners, on the other hand, had inflated mortality relative to their place of residence since they were slightly less urbanized than the nation as a whole. The sample of American miners is small, however, and may not provide highly reliable measures of the mortality of this group.

Somewhat offsetting the indications of greater inequality in England and Wales, agricultural laborers did much better there than in the United States. Some of the excess of this group in the U.S. is traceable to the disproportionate representation therein of the black population, but American agricultural laborers did not do particularly well even within the native white population.

When the occupations for both countries are regrouped into the 1950 U.S. Census categories (first panel of Table 5.3), the greater advantage of the professional and technical group in childhood mortality in England and Wales is retained. It is possible that the census definitions of these occupations were more "upscale" at that time in England than in the United States, but a study of relevant sources does not give cause to believe that occupational descriptions were systematically different between the countries (U.S. Bureau of the Census 1979:35–36; Armstrong 1972:191–92, 203–11, 226–28). A more plausible explanation is to be found in the relative economic positions of these groups.

Table 5.4 presents, for selected detailed professional and white-collar occupations in both countries, the mortality index, the estimated average annual male earnings (in American dollars), and the percentage of members of the occupation living in urban areas.[6] Clearly,

TABLE 5.4

Index of Child Mortality, Income, and Percentage of Urban-dwellers for Selected Occupations of Father: U.S., 1900, and England and Wales, 1911

Occupation	*Child mortality index*	*Yearly income (dollars)*	*Income index (overall = 100)*	*Percentage of urban-dwellers*[a]
United States, 1900				
Professional, Technical	0.9450	905	142	50
Teachers	0.9994	590	93	28
Clergy	0.8048	730	115	25
Physicians & Surgeons	0.9422	1,000	157	43
Clerks & Copyists	0.9208	714	112	81
Total	1.0087	636	100	37
England & Wales, 1911				
Professional, Technical	0.6181	1,500	362	82
Teachers	0.5412	785	190	79
Clergy	0.4713	1,080	261	62
Physicians & Surgeons	0.4035	1,920	464	84
Commercial & Business Clerks	0.6797	466	113	93
Total	1.0000	414	100	78

Source: See Tables 5.3 and 5.6.

Note: For the construction of the child mortality index and the income estimates, see Chapter 3, Appendix A, and Table 5.6.

[a] For the U.S., percentage of urban-dwellers is percentage of women used to calculate the index who were living in cities of 5,000 and more in population. For England and Wales, percentage of urban-dwellers was the official census definition for 1911 for the occupations in question. Urban areas included London, municipal and county boroughs, and other urban districts. These essentially were urban areas over 5,000 population.

the relative income level for the professional and technical occupations was higher in England and Wales than in the United States. While mean income for professional and technical workers was 42 percent higher than average in the U.S., it was 262 percent higher in England and Wales. Within specific groups of professionals—teachers, clergy, and physicians and surgeons—English workers also did better than their American counterparts, both relatively and (using the gold standard's currency conversion rate) absolutely. American teachers, clergy, physicians and surgeons, and professional/technical workers in general, all had relative child mortality indices in 1900 that were also substantially less favorable than their counterparts in England and Wales in 1911.

Residential patterns are also mildly implicated in the differences between the relative child mortality of professionals in the two countries. Using the urban definition of 5000+ population, professionals were more highly urbanized in the U.S. relative to the population as a whole (50 percent versus 37 percent) than in England (82 percent versus 78 percent). Among clerical workers, whose relative economic conditions were quite similar in the two countries, residential differences were probably more consequential. The fraction of clerical workers who were urban was more than double the national average in the U.S., but only 19 percent higher in England. This difference is probably reflected in the relatively high mortality of children in this group in the U.S. compared to England and Wales.

It seems likely that the comparative mortality advantage of professionals in England is in good measure attributable to their comparative economic advantage. This advantage may in turn reflect the greater success of England's professional societies in restricting access to the professions (Routh 1965). The Royal College of Physicians and Surgeons was established in the eighteenth century, and the Medical Act of 1858 had tightened licensing requirements for physicians (Woods and Woodward 1984:69). In the United States as late as 1900, however, "the ports of entry into medicine were still wide open and the unwelcome passed through in great numbers" (Starr, 1982:116). That British physicians were more effective at protecting themselves than protecting the public at large is suggested by the fact that $q(5)$ in England and Wales during 1901–10 (.192) was still higher than it was a decade earlier in the U.S. ($q[5] = .180$, from Chapter 2). The children of physicians were healthier in Britain, but children in general were healthier in the United States. Much of the advantage of American children, of course, reflected the society's rural character, which supplied more protection against disease than did the nostrums of physicians.

The relatively high status of professionals in England relative to the U.S. was not limited to physicians. In general, it can be said to reflect England's longer and more intensive experience with urban industrial society and the occupational differentiation that it fostered. English class divisions were well established and widely recognized by the middle of the nineteenth century (Briggs 1956–57) and were the model—a very atypical one—for Marx's theory of capitalist development (Rubinstein 1977). Professionals had been more successful in England in restricting access through licensing and also tended to serve a more elite clientele (e.g., teachers were more likely to serve the upper classes since education was less universal in England). In the United States, the movement to professionalize the professions—

8. The children of physicians and surgeons had mortality that was only 6 percent below the national average, reflecting both physicians' relatively lower status and the shortage of effective preventions and cures. Shown here is a Wisconsin doctor and his family.

to restrict access and assure some minimum level of expertise—was principally a product of the Progressive era and achieved momentum mainly in the first decade of the twentieth century (Kunitz 1974).

More explicit measures of inequality presented in Table 5.5 confirm that child mortality was more unequally distributed by social class in England and Wales. In this table we use both the occupation classification system of England and Wales and that of the United States. The coefficient of variation (standard deviation divided by the mean) shows greater dispersion of childhood mortality across social classes in England and Wales than in the United States, whether the coefficients weight all classes equally or whether they weight classes by the number of children ever born into them. Within the United States, inequality in child mortality was generally greater among foreign-born whites than among native whites (although the difference disappeared when using the 1911 English classes and weighting by children ever born). The greater apparent inequality within the

TABLE 5.5

Measures of Inequality in Child Mortality: England and Wales, 1911, and U.S., 1900

	United States, 1900					*England and Wales, 1911*
	Total	*White*	*Native white*	*Foreign white*	*Black*	*Total*
Coefficient of variation						
1950 U.S. classes						
Unweighted	.1328	.1219	.1077	.1203	.2321	.2431
Weighted[a]	.1537	.1717	.1447	.1586	.1336	.1974
1911 English classes						
Unweighted	.1383	.1618	.1441	.1701	.2495	.2293
Weighted[a]	.1592	.1772	.1539	.1540	.1514	.1959
Index of dissimilarity						
1950 U.S. classes	.0654	.0718	.0641	.0682	.0651	.0782
1911 English classes	.0718	.0784	.0654	.0676	.0611	.0744
Mean Deviation						
1950 U.S. classes						
Unweighted	.1177	.0800	.0824	.1114	.3529	.2285
Weighted[a]	.1331	.1353	.1112	.1537	.1512	.1710
1911 English classes						
Unweighted	.1436	.1381	.1243	.1613	.3120	.1950
Weighted[a]	.1436	.1465	.1132	.1516	.2140	.1567
Atkinson Index ($\varepsilon = 2.5$)						
Own Weights						
1950 U.S. classes	.0606	.0774	.0573	.0668	.0481	.1029
1911 English classes	.0558	.0702	.0509	.0606	.0430	.0870
Standardized to 1911 English weights						
1911 English classes	.0441	.0547	.0401	.0686	.0356	.0870
	Estimated income[b]					
Coefficient of variation						
Social classes						
1950 U.S. classes[c]						
Unweighted	.3604					.7888
Weighted[a]	.3760					.4628
1911 English classes						
Unweighted	.3666					.4487
Weighted[a]	.3738					.3436
Detailed occupation groups						
Unweighted	.3048					.9608
Weighted by children ever born	.3969					.5191
Weighted by number of income earners	.4052					.5928

Source: Table 5.3 and text.

Note: Coefficient of variation $= \frac{\sigma}{\bar{X}}$, where σ is the sample standard deviation and $\bar{X}$ is the sample mean.

TABLE 5.5 (*cont.*)

Index of dissimilarity: $\Delta = \frac{1}{2} \sum_{i=1}^{k} |X_i - Y_i|$ where X_i and Y_i are the uncumulated proportional distributions of two distributions. In this case, the distributions are the actual and expected deaths of the social-class categories.

Mean deviation $= \sum_{i=1}^{N} |X_i - \bar{X}| \Big/ N$, where $\bar{X}$ is the population mean (and not the sample mean).

Atkinson index: $I = 1 - \left\{ \sum_{j=1}^{n} [\bar{Y}_j/\bar{Y}]^{1-\epsilon} f(Y_j) \right\}^{1-\epsilon}$, where $\bar{Y}_j$ is the mean value of the j^{th} group, $\bar{Y}$ is the overall mean, $f(Y_j)$ is the proportion in the j^{th} group, and ϵ is some number, taken here as 2.5 (a commonly used value). See Atkinson 1970 and Williamson 1982b. $F(Y_j)$ is the distribution of children ever born.

[a] Weighted by number of children ever born.

[b] Earnings were imputed for 166 male occupational groups for England and Wales in 1911, and 93 male occupational groups for the United States in 1900. These were then aggregated into social classes. For the sources and methods, see Appendix A and text.

[c] Excluding agricultural (class 2).

American black population disappeared when the occupational groups were weighted because there were so few blacks in the more privileged classes.

The second measure of inequality, the index of dissimilarity, is calculated by taking one-half of the absolute difference between the proportions of actual and expected child deaths in each social-class group. It is inherently a weighted indicator and measures the extent of redistribution of child deaths necessary to make each group's mortality equal to the national average. This index also shows that greater inequality characterized England and Wales, although the relative size of the inequality was smaller, especially using the 1911 English categories of social class.

The third measure, the mean deviation of the mortality index from its group average, confirms the result from the coefficient of variation. In this case, native whites consistently showed less inequality than foreign-born whites and blacks in the United States. Finally, Atkinson's (1970) index of inequality, also an inherently weighted index, supports the basic finding of greater inequality in England and Wales. It does not much matter whether groups are weighted in the index by their own proportional distribution or by some standard set of weights (for instance, the distribution of population across the eight social classes of England and Wales). That is, the disparity in amounts of inequality that are shown in weighted measures does not appear to be attributed to differing distributions of births by social class in the two countries.

Clearly, there was a greater degree of dispersion of mortality rates across social classes in England and Wales than in the United States. This dispersion may reflect widening mortality differentials during the mortality decline because of an uneven distribution of the factors causing the decline. Although English child mortality was still slightly higher than in the U.S. a decade earlier, it apparently began its decline from a substantially higher level (Keyfitz and Flieger 1968:526; Mitchell and Deane 1971:36–43; Haines 1979a: Table 7; see also Chapter 2). The lower apparent inequality in the United States may also have been caused partly by the later measurement of the differentials for England and Wales across a decade critical for the development of medicine and public health in both countries (Shryock 1947: ch. 15; Benjamin 1964; see also Chapter 1 above). Access to and utilization of health care by the upper classes may have been more effective in England and Wales by 1911.

There were also differences in economic structure. Despite the rapid growth of the American economy since the Civil War, Britain had a more "mature" economy with a higher proportion of the population in urban areas and a larger percentage of the labor force in the secondary and tertiary sectors (91 percent in 1901 versus 65 percent for the United States in 1900; Kuznets 1966:107–8, 272). Although there is some evidence of worsening income distribution in both countries during the nineteenth century, no clear trend was apparent by the turn of the century (Williamson and Lindert 1980:281–85; Williamson 1982b:22–24).

As a step toward understanding the source of these differences in mortality inequality, estimation of earnings was undertaken for the various occupational groups in England and Wales to supplement the estimates for the United States made in Appendix A. Some of the basic results are presented in Table 5.6.[7]

Coefficients of income variation are calculated for these groups (weighted and unweighted) and for the detailed occupational groups (116 for England and Wales and 93 for the United States) used in the subsequent regression analysis. They are presented in the last panel of Table 5.5. The coefficients of variation for earnings were, with one exception, greater for England.[8] Greater mortality inequality in England was evidently matched by greater inequality in earnings, obviously suggesting that the two are related. Higher incomes could of course purchase better diets, clothing, sanitary facilities and water supplies, and, perhaps most important, larger and less congested housing. When income inequality is greater, it is reasonable to suppose that inequality in mortality will also be greater. The next section tests this proposition more explicitly.

TABLE 5.6
Estimated Earnings by Social Class of Father (current dollars): U.S., 1900, and England and Wales, 1911

	United States, 1900		*England and Wales, 1911*	
	Income	*Index*	*Income*	*Index*
American occupational classification				
Professional, Technical	905	142	1,502	363
Agricultural (excluding Laborers)[a]	(436)	(68)	(247)	(60)
Agricultural Laborers	257	40	228	55
Managers, Officials, Proprietors	1,077	169	523	126
Clerical	790	124	458	111
Sales	710	112	—	—
Craftsmen, Foremen	695	109	435	105
Operatives	580	91	389	94
Service Workers	618	97	330	80
Laborers	438	69	283	68
England and Wales classification				
Professional, Higher White-Collar	942	148	839	203
Lower White-Collar	780	122	358	86
Skilled Manual Workers	680	107	422	102
Semi-Skilled Manual Workers	611	96	360	87
Unskilled Manual Workers	421	66	298	72
Textile Workers	523	82	362	88
Miners	482	76	420	101
Agricultural Laborers	257	40	228	55
Total	636	100	414	100

Source: U.S. Commissioner of Labor 1903:264–82; Lebergott 1964: passim; Douglas 1930: passim; Routh 1965: ch. 2; Williamson 1982b; Great Britain 1909–13.

Note: Earnings were imputed to the 1900 American census sample by assigning to each of the occupational codes (using the 1900 coding system) average annual incomes based primarily on the United States Commissioner of Labor 1901 cost-of-living survey, but augmented by work by Lebergott and Douglas. No estimates were made for farmers. Estimates for groups were aggregated up from the sample.

For England and Wales in 1911, several sources were used. These included the Board of Trade, Routh and Williamson. In this case, most earnings were available on a weekly basis. Following the practice of Routh and Williamson, the results were simply multiplied by 52 to obtain full-time equivalent annual earnings. In that sense, these results are not strictly equivalent to the American estimates. Since no estimates of unemployment were available, it was felt that this was best. The estimates were made for 116 occupational groups or aggregations. Any reaggregations (e.g., into social classes) were made from these 116 groups. Among the groups for whom earnings were lacking were, notably, farmers and proprietors of a number of types (e.g., retail merchants).

The English estimates apply to a period roughly 1901–11. They were converted to American dollars at an exchange rate of 1£ = $4.85. The American estimates apply to a period approximately 1899–1901.

[a] Based on few cases (e.g., shepherds, farm managers, market gardeners).

Regression Analysis of Comparative Occupational Mortality Differences in England and Wales and the United States

The difference between patterns of differential mortality by occupation in the United States and England may reflect differences in the attributes of an occupation (e.g., income or proportion urban) or differences in the manner in which those attributes are translated into mortality. In order to see which of these two processes is principally at work, we have estimated two basic models for each country:

(1) $M_i = a_1 + b_1 \ln Y_i + c_1 U_i + \xi_{i1}$

(2) $M_i = a_2 + b_2 \ln Y_i + c_2 U_i + \sum_j d_j D_{ij} + \xi_{i2}$,

where

M_i = child mortality index for occupation i;

Y_i = mean earnings in occupation i;

U_i = percentage urban of persons in occupation i;

D_{ij} = dummy variable indicating whether occupation i is a component of social class j (using English social-class categories);

ξ_{ij} = error term, assumed to be normally distributed and uncorrelated with $\ln Y_i$, U_i, and D_i.

These models are estimated using weighted least squares regression, where the weights are the number of children ever born in occupation group i. There are 93 specific occupational groups used in the United States and 116 in England and Wales. Note that the child mortality index is multiplied by 1000 to create the dependent variable in each case. Results are shown in Table 5.7.

Results from Model 1 (equations [1] and [2]) suggest that the mortality payoff to the earnings of an occupation was quite similar in the U.S. and in Britain. The coefficients of the earnings variable are -275 and -321, respectively. A 1 percent increase in earnings is associated with a reduction in the (untransformed) mortality indexes of 0.27 percent and 0.32 percent. Both coefficients are highly significant. The somewhat higher coefficient in England is consistent with the country's lower level of national income, since we expect to observe diminishing returns in the mortality effects of income gains, an effect not entirely captured by using a logarithmic transformation of income (Preston 1975). Since earnings were more unequally distributed in England and Wales, the similarity of coefficients implies that some of the greater inequality in child mortality in England resulted from the greater inequality of earnings.

Urban location exacted about twice as high a penalty in England as in the United States, which is roughly consistent with results of individual-level analysis. The amount of inequality in the urban/rural

TABLE 5.7

Regression Equations Predicting Child Mortality within Specific Occupational Groups: U.S., 1900, and England and Wales, 1911

	Model 1				Model 2							
	(1) U.S., 1900		(2) England and Wales, 1911		(3) U.S., 1900		(4) U.S., 1900		(5) England and Wales, 1911		(6) England and Wales, 1911	
Independent variables	*Coefficient*	*Significance*	*Coefficient*	*Significance*	*Coefficient*	*Significance*	*Coefficient*	*Significance*	*Coefficient*	*Significance*	*Coefficient*	*Significance*
Constant	2,699.66	***	2,588.22	***	899.21	***	1,237.71	*	632.98	***	354.18	—
Percentage urban	2.63	***	5.27	***			1.12	—			6.39	***
Log husband's earnings (US$)	−274.72	***	−320.96	***			−59.27	—			−42.44	—
Husband's Social Class[a]												
Professional & Higher White-Collar					NI	NI	NI	NI	NI	NI	NI	NI
Lower White-Collar					62.90	—	25.19	—	228.82	***	242.50	***
Skilled Manual					243.50	***	217.53	***	353.94	***	362.78	***
Semi-skilled Manual					194.45	***	170.39	**	448.05	***	434.71	***
Unskilled Manual					318.00	***	282.56	***	647.63	***	637.96	***
Textile Workers					96.24	—	42.46	—	628.29	***	558.80	***
Miners/Mine Workers					70.26	—	80.21	—	718.92	***	808.09	***
Agricultural Laborers					245.59	***	233.14	—	184.48	***	603.96	***
N	93		116		93		93		116		116	
Adjusted R-Squared	0.175		0.210		0.261		0.252		0.723		0.813	
F-ratio	10.76	***	16.28	***	5.64	***	4.43	***	43.96	***	56.71	***

Source: See Tables 5.3, 5.6, and text. Also England and Wales 1914: tables 7, 8, 13, 15.

Note: Sample consists of married women with husband present. The dependent variable is 1000 times the child mortality index. The weights for the regressions are the number of children ever born for each observation. The observations are (husband's) occupational groups. For the U.S. sample, all women married 0–24 years were used to calculate the index. For England and Wales, all women married 0–14 years were used to calculate the index. The significance levels are: *** = significant at least at a 1 percent level; ** = significant at least at a 5 percent level; * = significant at least at a 10 percent level; — = not significant at least at a 10 percent level; NI = not included.

[a] 1911 English social classes.

distribution, however, was similar in the two countries. Inequality is at a maximum on a dichotomous categorical variable when the population is equally distributed between the two categories, and England and the U.S. were roughly equal distances from equality in their urban/rural distribution when comparable urban definitions are used.[9] Therefore, the disparity in coefficients of proportion urban contributes little to explaining inequality in mortality.[10]

Most of the variation in occupational mortality levels in either country is unexplained by Model 1, so earnings and urbanization differences are not the keys to understanding the international differences in occupational inequality in mortality. Furthermore, when social-class categories are introduced in Model 2 (equations [3]–[6]), the coefficients of earnings in both countries drop considerably in size, remain negative and similar to one another, and become statistically insignificant. The simple eight–category class variable constructed by the Registrar General of England and Wales conveys more information about mortality than do the earnings of the 100-odd detailed occupations. There is a spectacular difference in the amount of variance in occupational mortality explained by social class in England compared to the U.S. Model 2 (including all variables) explains 81 percent of the variance in England and 25 percent in the U.S. In addition, coefficients are much larger in England. Class variation in mortality remains greater even if the outlying "professional and higher white-collar" group is omitted.

It is possible that the British class variables work so much better in England because they were tailored to British circumstances (Szreter 1984). To examine this possibility, we repeated the analysis using the occupational categories in the United States for both countries. Results were scarcely altered: occupational class was far more significant in explaining mortality variation in England, and class variations themselves were much larger there.

Thus, it does not appear that wider disparities in earnings per se were responsible for most of the greater mortality inequality in England. Model 1 explains little of the variation in occupational mortality in either country, but Model 2, which introduces social class, explains the bulk of variation in England. Evidently, social class in England connoted a constellation of factors related to mortality: earnings, education, style of life, housing, security, residential amenities, privilege, empowerment, and so forth. English society was apparently far more stratified and differentiated along these lines than was American society at the time.

One factor that we are not able to measure adequately may have contributed to the larger social-class differentials in England: a

greater degree of residential segregation by occupational class. We saw in Chapter 4 the importance of residential factors even when measured in such gross categories as size of place and region of residence. Public services such as water and sewer systems varied substantially within cities as well as across cities (Condran and Crimmins-Gardner 1978; Condran and Cheney 1982; Condran, Williams and Cheney 1984). Yet the dominant basis of segregation in Detroit (and probably other American cities) in the 1890s was still ethnicity rather than occupation (Zunz 1982). In other words, there was still a substantial mixture of social classes within smaller areas of the city, a mixture that would later disappear. It is likely that the more highly differentiated social-class system in England had manifested itself in residential distinctions as well. Ashby's monograph on infant mortality in England argues that "one of the reasons why infant mortality is so much higher in crowded industrial districts is that the people are all of one class, and that often the most ignorant. . . . In the towns there is not enough mixing of the classes for the very poorest to derive the benefit of contact with richer neighbors" (Ashby 1922:40). There were also important class divisions *across* cities, with the commercial elite and the professionals that served them heavily concentrated in London and the industrial activities concentrated in the North (Rubinstein 1977). In this context it is noteworthy that London had 13–25 percent lower mortality than did urban areas of the North (Table 5.1).

We are left without a wholly persuasive explanation of why British mortality differentials by social class were so much larger than those in the United States. Undoubtedly, the greater inequality of income in England was playing a role, but our set of occupational classes is far more predictive of mortality than is the income of detailed occupations. A higher degree of residential segregation by occupation in England, combined with residentially differentiated public service and weak diffusion of information and practices across places, may also be part of the explanation. In any event, we should beware of treating England's differentials as the norm. Matthiesson's (1972) study of social-class differences in child mortality in Copenhagen in the 1870s—the only other area that appears to have comparable historical data—shows them to be more similar to those in the United States than to those in Britain. For example, "teachers and clerks" had a value of $q(5)$ that was 88 percent of the value for Copenhagen as a whole, compared to values for the two groups (from Table 5.4) of 1.00 and .92 in the U.S. and .54 and .68 in England and Wales. As a city, Copenhagen would be expected to have larger occupational

mortality differentials, as we demonstrated in Chapter 4. As Rubinstein's study of social classes in Britain concludes,

> In so many ways Britain is an anomalous country: the first with a bourgeois revolution, the last with an aristocracy; the earliest with a modern working class . . . the earliest with industrialization, yet the last among the advanced countries to witness a merger of finance and industry, and so on. Britain is always an exceptional case, and too often its being first has been confused with its being the norm. Marx himself, one suspects, would have been better employed in the Library of Congress than in the British Museum. (Rubinstein 1977:126).

The contrast between the more rigid and hierarchical British class system and the more fluid, permeable, egalitarian American class system has become almost a cliché. Such a contrast could hardly be more vividly revealed than in patterns of class differences in child mortality at the turn of the century. Because of the long tradition of solid data on the subject in Britain, it has become a model for our understanding of these relations (e.g., Antonovsky 1967). Clearly, the model needs drastic alteration if it is to comprehend the American situation. Yet we must not forget that a major dimension of stratification was operative in the United States and absent in England: race. As we showed in Chapter 4, even though there is relatively little statistical variation in this dichotomous variable, race was the single most important factor in predicting child mortality levels.[11] To a major extent, what occupational class was to England, race was to the United States.

Comparative Mortality Differentials in the United States in 1900, and Contemporary Developing Countries

The range of circumstances under which mortality differentials are compared can be greatly expanded by introducing data from contemporary developing countries. England and the United States at the turn of the century were, after all, not too dissimilar in income levels, and they shared a common, and by modern standards rather primitive, base of health knowledge. Contemporary developing countries offer a sharp contrast on both of these dimensions. The scheme that underlines the analysis can be illustrated as shown in Table 5.8.

Obviously, both income and health knowledge are distributed along a continuum rather than dichotomously. But by choosing the two relatively discordant circumstances represented by cases B and C, we expect to be able to illuminate the important role of both sets

TABLE 5.8
Analytic Scheme For Comparing American Child Mortality in the Late Nineteenth Century to That of Third World Countries Today

Level of economic development	*Level of technical knowledge about health*	
	Low	*High*
Low	(A) Third World countries in the nineteenth century	(B) Third World countries today
High	(C) United States in the late nineteenth century	(D) Developed countries today

of factors under varying circumstances. That the United States in the late nineteenth century was a relatively rich country is shown by the following data. According to the National Bureau of Economic Research's series of GNP estimates, per capita GNP in the United States in 1929 dollars rose from $415 to $497 between 1890 and 1900 (U.S. Bureau of the Census 1966: Series A11). Converted into 1982 dollars, the range is from $2,148 to $2,572. This places the United States in the period 1890–1900 in a range with Hungary, Portugal, Romania, Argentina, and Chile today (World Bank 1984:219). But while these latter countries have a life expectancy at birth of 70–71 years (ibid.), the United States in 1895–1900 had a life expectancy of only 49–51 years, as shown above.

The United States in 1890–1900 was also relatively well educated. Of youths aged 5–17, 78–79 percent were enrolled in school, although the average pupil appears to have attended school only the equivalent of about four months per year (U.S. Bureau of the Census 1966: Series B 36–39). In 1910, the median adult had attended school an average of 8.1 years (ibid.: Series B 40), and a prior absence of trend in school enrollment figures suggests that the figure was not much lower twenty years earlier. In the 1900 United States Census, 87.8 percent of ever-married women were literate, as were 89.0 percent of their husbands. Like income, these are also very high levels relative to most developing countries today.

Why didn't these high levels of literacy and income translate into higher levels of life expectancy? Our answer—tautologically correct in view of the universality of goals to improve health—is that the United States in this period simply did not know how to effect this conversion. As discussed in Chapter 1, the germ theory of disease still met with opposition or indifference in many circles as late as

1900. The filth or miasmatic theory of disease had occasionally led to effective public-health interventions, especially when combined with sensible empiricism. Where accepted, the germ theory added impetus and appropriate direction to these efforts. Urban residents had awakened to the importance of clean water and proper sewage disposal, but most were living without either. On the other hand, they appeared relatively indifferent to the cleanliness of the milk supply. Physicians and hospitals had few tools at their disposal to arrest the progress of disease, and home remedies enjoyed immense popularity. The most enlightened public-health officials, such as Charles Chapin and Herman Biggs, saw clearly the implications of germ theory for preventive health care, but they despaired at the difficulties of getting the word across to physicians, let alone parents.

By modern standards, ignorance about both preventive and curative health care was widespread in the United States at the turn of the century. As a result, we expect to observe a different pattern of mortality differentials than the pattern that prevails today in the developing world. In particular, there should have been much less payoff to increasing amounts of schooling in turn-of-the century America than in today's developing nations. Schooling effects should reflect only the accretion of material resources that result from the increased earnings opportunities; the additional portion of the effect that would reflect closer connection to good health knowledge and practice among the well-educated should be largely inoperative in a situation where education "buys" one little knowledge. Indeed, for similar reasons, the size of *all* social-class differentials in mortality should be smaller in the United States in the period 1890–1900.

In order to compare differentials in the U.S. in 1900 to those in developing countries today, we draw upon a study conducted by Barbara Mensch, Harold Lentzner, and Samuel Preston at the University of Pennsylvania (United Nations 1985). This study uses data on children ever born and surviving to study child mortality differentials in fifteen developing countries. The same analytic strategy was employed as in the present study, focussing on the ratio of the number of dead children to the expected number of dead children. For present purposes, four of the countries are excluded: Sierra Leone, Sudan, and Jamaica because of small sample size and/or severe regional restrictions in the sample, and Liberia because husbands could not be linked with wives.

Child mortality differentials by mother's educational attainment for the remaining eleven countries are converted into literacy differentials in Table 5.9. No other variables are controlled in this table. Lacking direct data on literacy in most of the developing countries, we

TABLE 5.9
Comparison of Relative Mortality Levels in Modern Developing Countries and in the United States, 1900

	Literate/illiterate ratio[a]		*Urban/rural ratio*[b]
U.S., 1900	.697		1.279
	Series 1[c]	*Series 2*[d]	
Ghana, 1971	.495	.361	.732
Kenya, 1978	.666	.613	.809
Lesotho, 1977	.851	.861	1.055
Southern Nigeria, 1972	.609	.611	.816
Indonesia, 1971	.631	—	831
Nepal, 1976	.483	.313	.519
S. Korea, 1976	—	.714	.873
Sri Lanka, 1975	.634	—	.875
Thailand, 1975	.319	—	.580
Chile, 1970	.699	.583	.782
Peru, 1978	.357	.264	.604
Mean developing countries	.574	.540	.770

Source: Table 3.1, United Nations 1985.

[a] Ratio of child mortality among literate mothers to child mortality among illiterate mothers.

[b] Ratio of child mortality among urban mothers to child mortality among rural mothers.

[c] Assuming women with 4+ years of education are literate.

[d] Assuming women with 7+ years of education are literate.

have presented two series, one assuming that literacy is achieved with four years of schooling, and the other that it is achieved after seven years of schooling. In either series, the difference from the United States is appreciable. Of the eleven countries examined, only Lesotho and South Korea (and Chile in one series) show a lower payoff to literacy than did the United States in 1900.

Multivariate results show the contrast even more vividly, although the absence of identical variables in the different countries means that exact comparability in specification cannot be achieved. Nevertheless, such standard factors as educational attainment (or literacy) of mother and father, occupation of father, and urban/rural residence

are available in all of the developing-country data sets as well as in the U.S. A well-known result is that mothers' education or literacy tends to retain a powerful effect in developing countries even after all other socioeconomic variables are controlled (e.g., Cochrane 1980; Clelland and van Ginneken 1988). Such a result is also observed in the developing countries examined here. The United Nations study (1985:56), which also uses weighted least squares regression of a woman's child mortality index, finds that the average coefficient for mothers' years of schooling in these countries, once all other variables are controlled, is about .034. If the illiterate have an average of one year of schooling and the literate an average of eight—reasonable figures in the United States in 1900—such a coefficient would imply that the literate should have about 25 percent lower mortality. But the coefficient on mothers' illiteracy in the United States reported in the final equation in Table 4-1 and in all the equations in Table 4.4 ranges between .06 and .14, only a quarter to a half of the expected effect for developing nations in the later twentieth century. Some of the literacy coefficients in the United States are also statistically insignificant, notably those for the urban and for the foreign-born populations. Literacy thus appears to matter least in the areas of greatest risk, namely the unhealthy urban environments.

The Children's Bureau study of eight American cities during 1911–15 included income data as well as literacy and many other variables. Literacy was dropped from the final report (Woodbury 1925), perhaps, as noted above, because preliminary results showed it to be unimportant. But a separate report on the largest city studied, Baltimore, presented a cross-tabulation of infant mortality by fathers' income and mothers' literacy (Rochester 1923). It is reproduced here as Table 5.10. Clearly, literacy has relatively little, if any, explanatory power after income is controlled, contrary to results observed in today's developing world.

Table 5.9 also shows very different relations between mortality and urban/rural residence in the United States and in today's developing countries. Urban residents (defined as living in places of 5,000+ residents to be more consistent with developing country definitions) had 28 percent *higher* mortality in the United States in 1900, compared to an average of 23 percent *lower* mortality in developing countries today. Multivariate results are also quite different for the two populations. In most of the developing countries examined, urban/rural residence loses its significance when other variables are introduced, and rural areas often have higher mortality than urban areas (United Nations 1985: ch. 11). The lower mortality of urban residents in developing countries as shown in Table 5.9 is thus primarily attrib-

TABLE 5.10
Infant Mortality Rate (per 1000 Births) by Literacy of Mother and Earnings of Father: Baltimore, 1915

	Literate mothers		*Illiterate mothers*	
Annual earnings of father	*Infant mortality rate*	*Births(N)*	*Infant mortality rate*	*Births (N)*
Under $450	161	1,193	143	349
$450–549	120	1,206	108	241
$550–649	107	1,314	126	174
$650 and above	79	5,660	86	233

Source: Rochester 1923:332.

utable to their higher social standing. But in the United States in 1900, urban residence loses no power when other variables are introduced; in some instances, the higher social status of urban residents actually served to mask some of the disadvantages of urban life. For example, the unvariate tabulations in Table 3.1 showed that residents in the 10 largest cities in 1900 had child mortality that was 23 percent higher than residents of cities with populations of 1,000–4,999. But when all other variables were controlled in equation (4) of Table 4.1, the differential increased to 30 percent. Cities posed a threat to life in the U.S. in 1900 that is simply no longer operative in developing countries.

Table 5.11 shows that occupational mortality differentials in the United States in 1900 are also much smaller than those observed in developing countries today. In particular, the professional/managerial/clerical classes had mortality levels only 7 percent lower than the national average, compared to the 35 percent advantage that this group enjoys, on average, in developing countries today. None of the eleven contemporary countries examined shows less than a 21 percent advantage for this group.

The other large discrepancy occurs for the agricultural group (farmers and farm laborers). This group had mortality 11 percent below average in the United States in the 1890s, but it shows mortality 21 percent above average in developing countries today. The comparison between professionals and agricultural classes is therefore particularly striking. Agricultural classes have mortality 85 percent *higher* than professional classes in the sample of LDCs today, but 5 percent *lower* mortality in the United States in 1890–1900.

TABE 5.11

Comparison of Relative Mortality in Different Occupational Classes: U.S., 1900, and Developing Countries in the 1970s

	Father's occupational category									
	Professional/ managerial/ clerical		*Sales*		*Service*		*Agricultural*		*Production workers*	
	Rel. mort.	*Exp. deaths (N)*	*Rel. mort.*	*Exp. deaths (N)*	*Rel. mort.*	*Exp. deaths (N)*	*Rel. mort.*	*Exp. deaths (N)*	*Rel. mort.*	*Exp. deaths (N)*
U.S., 1900	.933	769	.831	173	1.001	165	.890	3,375	1.150	2,967
Mean of eleven developing countries	.652		.913		.841		1.206		1.007	
Ghana, 1971	.621	2,948	.775	874	.665	1,179	1.128	30,446	.802	5,081
Kenya, 1978	.652	425	.887	388	.665	1,179	1.059	1,943	1.051	1,203
Lesotho, 1977	.743	66	1.343	35	.984	85	1.197	66	1.006	1,705
Southern Nigeria, 1972	.726	536	.933	252	.910	111	1.195	10,481	1.052	421
Indonesia, 1971	.789	11,721	1.033	6,850	1.002	2,402	1.000	43,467	1.028	3,965
Nepal, 1976	.784	187	.844	173	.760	148	.995	3,884	1.253	423
S. Korea, 1971	.673	101	.883	613	—	—	.956	1,266	1.088	491
Sri Lanka, 1975	.556	225	.868	242	.767	189	1.141	1,288	.938	771
Thailand, 1975	.606	132	.519	108	1.061	72	1.123	1,378	.881	278
Chile, 1970	.629	455	1.128	196	.866	135	1.213	685	1.059	1,444
Peru, 1978	.401	491	.828	406	.732	209	1.304	2,197	.921	1,242

Source: United Nations 1985 and sample of census enumerators' manuscripts, United States 1900.

Note: The relative mortality is the ratio of deaths to expected deaths among children ever born. Expected deaths are based upon the average child mortality level in a particular country.

The explanation for the poor performance of professional classes in the United States at the turn of the century is not to be found in a peculiar composition of the group. The subgroup that we can label the intelligentsia—those whom we expect to be best apprised of good hygienic practices—shares the unexpectedly high mortality of the professional classes. The combined group of physicians and surgeons, clergymen, teachers, lawyers, and pharmacists had a mortality index of .853 (Table 5.4; Preston 1985).[12] Preliminary tabulations from the U.S. Census of 1910, prepared at the University of Pennsylvania, continue to show only slight differences from national mortality levels for children of physicians or teachers.

Taking the figures in Table 5.11 one step farther, we can estimate the absolute (rather than the relative) mortality of children born into the different classes in the United States during 1890–1900 and in a composite of LDCs today. The composite is formed in the following way. The level of life expectancy at birth in LDCs in 1975–1980, as estimated by the United Nations (1983b), was 54.8 years. This corresponds to level 15.6 in the Coale-Demeny West model life tables. At that level, the probability of dying before age 5 ($_5q_0$) is .137. The mean of relative mortality levels for a particular class in Table 5.11 for our eleven LDCs is then applied to this figure to produce the values in Table 5.12. This procedure assumes that the average relationship observed among the eleven countries is representative of the average of all LDCs. "West" mortality levels are in fact relatively close: an average level of 14.9 for our eleven countries, versus 15.6 for LDCs as an aggregate. The United States 1900 West level is estimated to be

TABLE 5.12
Estimated Probability of Dying before Age 5 in Two Populations

Father's occupational category	*U.S., 1900*	*Composite of developing countries, 1975–80*	*Ratio*
Professional, Managerial, Clerical	.165	.089	.539
Sales	.146	.125	.856
Service	.176	.115	.653
Agricultural	.157	.165	1.051
Production Workers	.202	.138	.683
All classes	.176	.137	.778

Source: Table 5.11 and Chapter 2.

13.65 (see Chapter 2), and relative mortalities in Table 5.11 are applied to the $q(5)$ of .176 that corresponds to that level. There is good reason to suppose that the multiplicative property of $q(x)$ that is implicit in our procedure is valid to a close approximation (Trussell and Preston 1982).

Table 5.12 shows that the United States in 1900 had much higher child mortality than today's developing world in every occupational class except agricultural workers. Its disadvantage was particularly great among the professional/managerial classes. The United States professional classes in 1900, in fact, had no better child mortality than agricultural workers in developing countries today, who are by every account a seriously disadvantaged group. The combination of high national income, high national literacy, and high relative social status in 1900 produced the same mortality level as is observed in the most disadvantaged large social group in the world today. Clearly, the manner in which material resources are converted into mortality levels has changed dramatically (see also Preston 1975, 1980).

So the failure to achieve satisfactory mortality conditions in the United States at this time was widespread. It extended to the literate, to professionals, and especially to urban residents. In our view, it principally reflected the shortage of specific techniques that could be used to reduce the incidence and severity of infectious diseases as well as a failure to implement some of the techniques that had recently become available. In developing countries today, the mother's education or literacy appears to retain such a high degree of explanatory power because it is associated with such health behaviors as vaccination of children, maintenance of hygienic conditions in the home, and receipt of professional health care for maternity and for child illness (Clelland and van Ginneken 1988; Rutstein, et al. 1988). But vaccines existed only against smallpox in 1900, and the care that women and children received from physicians or midwives was often misguided and uninformed. Perhaps most important, there was still only a dim appreciation that the transmission of the major childhood diseases could be blunted by simple preventative public and private measures involving milk, water, food, handwashing, isolation, and the like. A growing recognition of the value of these measures is likely to be a major source of rapid declines in American child mortality in the first three decades of the twentieth century (Ewbank and Preston 1989).

Admittedly, the relatively high mortality levels seen in the professional classes reflected in part the lower standards of admission into these classes at the time. But in the case of physicians, the most telling of our categories, the low standards for practice were associated

with the shortage of medical knowledge of certifiable accuracy. The ascendance of the germ theory and of demonstrably effective diphtheria antitoxin was the major impetus for the reform of medical standards in 1910 (Kunitz 1974). In a sense, then, the low admission standards were simply another reflection of how little specialized knowledge the professions controlled.

The high levels of mortality also reflect a failure to activate fully the political institutions that were capable of preventing the spread of disease. C.E.A. Winslow argued that, in assigning responsibility for rapid health progress, the discovery of the possibility of widespread social organization to combat disease could almost be placed alongside the discovery of the germ theory in importance (Shryock 1957:56). The excess mortality among urban residents in 1900 (and in England in 1911), now averted in poor and rich countries alike, is clear evidence that political institutions were far from realizing their potential for improving health conditions.

Those who consider the death rate to be a relatively simple function of economic resources in the family or in society at large can find little support in these results. Undoubtedly, economic factors were important in differentiating among mortality levels at the turn of the century—perhaps even more important than at present—but they were merely variations on a theme of ignorance and incapacity that principally distinguishes that era from the present. Advances in science, diffusion of knowledge of preventive measures, and improvements in social organization, rather than economic growth per se, appear primarily responsible for the dramatic successes that were to come, both in the U.S. and in much poorer countries.