Income Redistribution and Mortality Change: The Cuban Case*

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A direct relationship between income and life expectancy levels is observed when comparing countries in historical and cross-sectional studies. The obvious explanation for the relationship is that higher average income levels are associated with better living conditions and with greater private and government expenditures on medical and other social services. Yet the association is not perfect, and as Preston has noted, "some of the observed scatter ... is almost certainly caused by differences in national income distributions.[1] This conclusion follows since in countries at similar levels of income those having a more unequal income distribution are more likely to have disadvantaged socioeconomic strata with poorer living conditions and less access to social services than in those countries where national incomes are more equitably distributed.

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The events that have taken place in Cuba over the last twenty years offer an opportunity to assess these relationships between income and mortality. In 1959 the country began experiencing a radical political process that profoundly altered historically established features of Cuban society. A broad series of social and economic structural transformations were instituted that have led to a more equitable income distribution, and that have particularly emphasized the reduction in living conditions differentials between urban and rural areas. As a result of these changes it appears that the secular trend of mortality decline in Cuba may have been accentuated. The advances made in the provision of health services and in raising income levels for previously disadvantaged social groups have been considerable enough to bring mortality in Cuba to levels that more closely approximate those found in the economically advanced nations than those that prevail in most developing countries. By the early 1970's, Cuba had attained a life expectancy of over 70 years, a figure reached by few other developing countries.

Of particular interest is that the additional gains in life expectancy since the early 1960's appear to have taken place in the absence of sustained economic growth. Throughout most of the 1960's economic conditions at an aggregate level were probably not very different from those found during the 1950's; during the early 1960's economic conditions actually deteriorated.[2] Only by the late 1960's or early 1970's does it seem that the economy began to stabilize and to show signs of growth.

The upgrading of levels of living for the disadvantaged social groups has been achieved through a number of means. The revolution had molded an austere society through the virtual elimination of the consumption of non-essential goods as national wealth was redirected towards the fulfillment of the more elementary needs, thus benefitting the poorest sectors of society. Rural-urban differences began to be reduced as the state made a disproportionate share of national investments in rural areas. These investments have included ambitious long range development projects with the goals of creating an infrastructure for economic growth (such as road building, irrigation projects, reforestation, etc.), and with the more immediate objective of creating employment opportunities for the rural population and for the urban unemployed. Other development programs geared to the elimination of social and rural-urban differentials included a very successful literacy and education program, various measures to upgrade housing conditions, and the provision of adequate medical services for all the population.

It is possible to partly account for the mortality changes that have occurred in Cuba over the past two decades by evaluating how these programs of income redistribution have affected living conditions for the formerly less privileged sectors of Cuban society. In this paper principal attention is focussed on the effects that these programs have had on extending the coverage of public health and medical services and on the assessment of the impact that their increased availability had on health conditions and mortality.

Public Health Policies

Four basic mechanisms were identified by the Cuban authorities through which overall health standards could be improved in the country. These were: (1) emphasis on preventive medicine; (2) improvements in sanitation and related areas; (3) improvements in nutrition, and (4) increased education of the public regarding health matters.[3] These mechanisms implicitly contemplated a more equitable access to the country's resources either through a wider coverage of health and other social services, or through the reduction of previously prevalent differentials in the partaking of life essentials. To a large extent the objectives of these policies are complementary and more often than not built on redistributive policies with goals extending beyond those of improving public health exclusively. How these policies have been instituted and to what extent they have been effective in attaining their objectives is discussed below.

(1) Emphasis on Preventive Medicine. A series of fundamental requirements must be fulfilled for a system of preventive medicine to operate successfully. These include, among others, the wide availability of medical services and the provision of these services at a sufficiently low cost to make them accessible to all socio-economic strata.

The first requirement -- that of extending the coverage of the medical services -- has been achieved primarily by the decentralization of the medical establishment in Cuba, as in many other countries, had been concentrated in the Havana area. It has also been facilitated by a large increase in the number of public health personnel at all levels of training (ranging from technicians to physicians). The

changes in the regional distribution of medical facilities in the country can be illustrated by considering the distribution of hospital beds in 1958 and 1973. The absolute number of beds and the number of beds per 1,000 inhabitants for all of Cuba and by province at both dates are shown in Table 1. As can be seen the overall ratio of beds to inhabitants increased by about 13 percent during the intervening years. The data for the provinces show the very important changes that have taken place at the regional level. In the Province of Havana the absolute number of beds over the fifteen-year period only increased moderately and the ratio of beds to population actually decreased by close to 20 percent. The opposite occurred in all the other provinces as both the absolute number of beds and the ratios increased significantly. In 1958, 61.7 percent of all the hospital beds in the country were in the Province of Havana but by 1973, that percentage had been reduced to 44.4.

The redistribution of medical facilities, moreover, has gone far beyond what Table 1 indicates. Prior to the revolution modern medical facilities outside the city of Havana had largely been limited to the provincial capitals and other large towns.[4] Beginning in the early 1960's rural medical facilities at least capable of providing a minimum of basic care have been established throughout the country. By 1975, 56 rural hospitals had been built in the least accessible regions of Cuba (mainly in mountainous areas).[5] These rural hospitals (and regional polyclinics in other areas) serve the needs of the surrounding population and operate as local branches of the main regional hospitals (in the provincial capitals). The rural facilities refer to the provincial hospital centers those cases which they are not equipped to handle. In turn, the main provincial hospitals serve as branches to certain national hospitals located in Havana that provide the most specialized services (e.g., neurosurgery).[6]

In large part the accomplishments of the rural medical programs have been attributed to two features that have been built into the training of physicians and supporting staff. One of these is the requirement that newly graduated physicians must serve a mandatory two-year period of service in rural areas. They are assigned to areas according to need, and generally serve in the more remote locations. More senior physicians from the regional centers provide support by periodical visits to the rural facilities.[7] The other important feature is the multiplication of training centers for other health personnel. Many of these training centers have been located in the areas where the students originate. The assumption behind the proliferation of the local training centers is that the medical needs in each area can best be served in this way because the trainees can identify with the conditions of their communities. Obviously this policy also contributes to the reduction of the gaps between the larger cities and the rest of the country by decentralizing the location of teaching institutions.

The second requirement, that medical services be placed within the reach of the population at low cost, has been achieved by nationalizing the practice of medicine. The private practice of medicine has almost completely disappeared from Cuba as most physicians today are employees of the state. Medical and hospital services are paid for by the state and no direct charges are made to the public for those services.

(2) Improvements in Sanitation. Numerous efforts have been made to improve the standards of hygiene and sanitation over the past years. While in 1953 about 55 percent of the urban population obtained its water supply from aqueducts, by the early 1970's this figure had increased to 90 percent. The number of urban centers with over 1,000 inhabitants having aqueducts has increased from 1975 in 1959 to 480 in 1971. At present, 98 percent of the water provided by aqueducts is chemically treated while in 1959 only 21 percent of the water supplied was similarly treated.[8]

The excessively high costs involved in supplying safe water and sewerage facilities to isolated rural dwellings have impeded considerable progress in these regards in rural areas. As a result, a policy has been devised by which the rural population is encouraged to settle in small villages of about 250 families where new modern housing, piped water, sewerage disposal, schools and medical services are provided.[9] Many of these modern rural communities have been created, although the latest figures suggest that only about 5 percent of the rural population presently resides in these communities.

Other initiatives in sanitation have been directed to the destruction of disease vectors. Water purification is but one instance. Extensive campaigns to destroy malaria-carrying mosquitoes and other carriers of disease have been pursued.

(3) Improvements in Nutrition. Nutritional improvements have also been the subject of attention, but there is some controversy as to whether or not the average nutritional status of the population has improved. During the early 1960's a system of food rationing had to be introduced in the country, which may have reflected a reduction in food supplies. The Cuban government has claimed that food rationing was necessary because there was a surge in demand as the initial impact of the policies of income redistribution was felt. Other sources have stated that the food shortages resulted from economic inefficiencies and a drop in agricultural productivity as the economy was socialized.[10] The rationing system is still in effect. According to official sources the allocation system provides 2,650 calories per day to each inhabitant of Cuba.[11] Further, it is claimed that the rationing guidelines provide supplementary allowances to the most vulnerable population sub-groups such as children and the elderly. A number of recent nutritional surveys have been reported that suggest that caloric intakes are adequate although certain vitamin deficiencies have been observed.[12]

(4) Increased Education of the Public Regarding Health Matters. The practical elimination of illiteracy from Cuba and the considerable upgrading of the educational levels of much of the population have served as vehicles through which public health campaigns have been vigorously carried out. The effective use of the printed and electronic media (all government controlled) has been called for mass vaccination efforts (diptheria, poliomyelitis, whooping cough, tuberculosis, tetanus, etc.), popularization of sanitary knowledge, etc. Highly structured mass organizations have also been relied on to reach all of the population concerning sanitary education as well as to guarantee full participation in public health efforts.

The favorable effects of the measures discussed above on the health conditions of the Cuban people are evident and can be assessed by relying on diverse sources of evidence. For instance, the expansion of the medical facilities to the whole country has led to a considerable increase in the percentage of all births that take place in institutions. From 1966 to 1973 the percentage of all births occurring in hospitals has increased from 77.1 percent to 98.0 percent.[13] Associated with the increased percentages of hospital deliveries, substantial declines in maternal and perinatal mortality have been recorded. Another instance that can be used to illustrate how productive some of these measures have been in improving health conditions and in reducing mortality refers to the diarrheal diseases. The mortality rates from these diseases have declined substantially in Cuba, but paradoxically their morbidity has not declined as much. Some analysts have suggested that a likely explanation is that in Cuba medical care and nutrition may have improved a great deal more than hygiene and sanitation. Hence, while morbidity rates have remained relatively high, mortality has declined as affected children are effectively treated with modern medical means at the first indication of the disease.[14] The greater availability of modern medical services and the increased awareness among the rural population of the causes and cures of these diseases account for the significant mortality decline, even in the presence of still high infection rates.

Impact of Income Redistribution Policies on Mortality

A direct assessment of the impact of the social and economic reforms instituted in Cuba since 1959 on mortality cannot be made since no comparable statistical series are available covering the whole time interval before and after the revolution. However, a cautious evaluation is possible through the analysis of fragmentary information for various regions of Cuba at both times, by comparing the present relative position of Cuba versus other countries in terms of cause-specific death rates, and by contrasting the estimated life expectancy levels for Cuba and other nations for dates close to 1953 and 1970, the two latest censal years for which reliable life tables for Cuba are available.

In Table 2 life expectancy estimates at birth for both sexes combined are shown for Cuba in 1953 and 1970, for the municipality of Havana in 1953, and for the six Cuban provinces in 1970. As can be noted during the intercensal period of 1953-70, a gain in life expectancy at birth of approximately 11 years was recorded. The extent to which these gains in life expectancy were distributed between the years before and after the revolution cannot be clearly determined, although there are some indications that by 1960, or just immediately after the revolution, life expectancy levels were probably in excess of 60 years.[15] Thus, over the period 1960-70, from six to ten years of life expectancy were gained, a significant gain if one considers the adverse economic conditions prevailing during most of the decade and the difficulties inherent in further reducing mortality as the highest currently recorded levels of life expectancy are reached.[16]

The data that are more suggestive of the changes that occurred over the intervening period are those shown for the municipality of Havana and for the provinces, although they are not strictly comparable. In 1953 the life expectancy value for the municipality of Havana was about four years higher than the one for the whole country, in spite of the fact that the Havana estimate reflects certain downward biases produced by the registration of deaths on a de facto basis and that the national estimate is upwardly affected by the inclusion of the more favorable experience of the capital city. The differences in level between the two estimates strongly suggest considerable differentials in mortality between Havana and the rest of the country. By 1970 these differentials appear to have been largely reduced as by then the province with the lowest life expectancy was but slightly below (about two years) the national average. The province of Havana itself, heavily influenced by the mortality experience of the capital city, had an estimated life expectancy in 1970 almost identical to the national estimate. It does not appear unreasonable to assume that the policies instituted to redistribute public health facilities and other social services are responsible for the observed reductions in regional mortality differentials.

Additional indications of the progress that Cuba has made in its mortality transition can be gained by comparing the country's cause-specific mortality data with similar data from other nations in the Western Hemisphere. Age-standardized cause-specific death rates (for selected causes) are shown in Table 3 for Cuba and seven other American nations. Even when taking into account the likely data shortcomings that detract from the perfect comparability of these data, it is

impressive to see that the age-standardized death rate for Cuba (all causes combined) is lower than that of any other Latin American country included in the table and that it lies at a level similar to that of the United States. The age-standardized cause-specific death rates for the communicable and infectious diseases are substantially lower in Cuba than in all the other countries shown except Uruguay and the United States. Regarding the degenerative diseases, Cuba occupies a middle position between the countries that experienced earlier fertility and mortality declines (Argentina, United States and Uruguay), and those that have lagged behind Cuba in their demographic transition.[17]

A final assessment of Cuba's progress in reducing mortality can be made by comparing life expectancy levels at birth estimated for Cuba and other countries circa 1953 and 1970. These data as well as per capita gross national products for Cuba and a number of selected countries for recent dates are shown in Table 4. As can be observed only a few Western Hemisphere countries exceeded Cuba in their life expectancies towards 1953, and these were among the most advanced in the world -- Canada and the United States -- and to a lesser extent Argentina and Uruguay. Puerto Rico also had a significantly higher life expectancy in 1953 that is explainable by the close ties of that island to the United States as an associate state. Of the other countries shown in the table, some were at about the same level of life expectancy as Cuba (Costa Rica, Jamaica and Trinidad and Tobago), or considerably lower as were the majority of the other Latin American countries not included in the table. In contrast, the estimated Cuban life expectancy level for 1970 was almost as high as that of Canada and the United States, perhaps higher than Uruguay and certainly above that of Argentina. Puerto Rico's life expectancy had kept pace with that of the United States and exceeded that of Cuba.

All of the gains in life expectancy recorded in Cuba between 1953 and 1970 should not be attributed to the socio-economic transformations experienced by the country. For one thing, medical advances continued to be made throughout the intervening period that in the absence of the institutional changes would have in any case favorably affected mortality. Examples of this are the vaccine against poliomyelitis that only began to be extensively used throughout the world by the mid- to late-1950's and the one against measles that began to be used even later. Also, additional progress in further reducing mortality almost certainly was made between 1953 and the time when the institutional reforms carried out in Cuba began to take place.

One way in which the impact of the institutional changes (and thus, of income redistribution) on mortality can be estimated is by comparing the data for Cuba with that of other countries which in or about 1953 had life expectancy levels similar to those of Cuba (Costa Rica, Jamaica and Trinidad and Tobago), and to assume that the experience of those countries reflect the effects that medical technology would have had on mortality independently of other changes. When this is done it can be seen that Cuba has outgained those countries in increasing life expectancies. Tentatively, it can be concluded that as a result of the elimination of social and regional inequalities in Cuba since 1959 the country has gained an additional two to three years in life expectancy in relation to countries that did not undergo those changes.

Clearly, the extra gains in life expectancy can be related to a more equitable access to medical attention and some of the general amenities of life for the Cuban population. Especially interesting is that these gains were made at the upper range of presently observable life expectancies where substantial gains are very difficult to achieve and in a country where per capita product is at a lower level than all but one of the countries included in Table 4. It is also important to indicate that most of the mortality declines resulted from declines in infant and childhood mortality where many preventive and curative measures had been long available but were not placed at the disposal of the rural population. The more equal distribution of the country's wealth following the revolution accounts for their wider availability since then.

Discussion

The achievements of the Cuban revolutionary government in reducing mortality are noteworthy. The structural changes that can be causally related to declining mortality suggest some of the potential benefits that other low income countries could gain by reducing social and regional differentials. However, when considering potential payoffs it should not be forgotten that by 1960 Cuba had already attained fairly favorable mortality levels. A life expectancy at birth of over 60 years almost two decades ago indicates that some of the essential conditions for low mortality were already present in Cuba by the time that the social and economic transformation began to take place. Those conditions are not yet found in many developing countries, thus only more moderate goals should be expected if similar policies were followed in these nations.

A final point worth mentioning concerns the social and political costs that the Cuban revolution has entailed. Many observers justify many of the excesses of the Cuban revolution by noting some of its social achievements, while forgetting that an authoritarian regime is not necessarily the only route to social justice. New paths should be sought whereby the dual goals of social justice and political freedom can be jointly pursued, rather than accepting the argument that social justice can only be achieved by forfeiting important political and cultural values.

Footnotes

1 Samuel H. Preston, Mortality Patterns in National Populations. New York: Academic Press, 1976, p. 78.

2 Some of the frequently cited reasons used to explain the deterioration of the economy during the 1960's are the exodus of skilled technical and managerial personnel, economic planning mistakes and disruptions caused during the transformation of a capitalist economy into a socialist one and the economic blockade of the country.

3 Ministerio de Salud Publica, Cuba - Organizacion de los Servicios y Nivel de Salud, Havana, 1974, p. 90.

4 Although since 1907 when the national public health ministry was created every municipality in the country provided at least some rudimentary medical services. See Foreign Policy Association, Problems of the New Cuba, New York: J. J. Little and Ives Company, 1935.

5 Ministerio de Salud Publica, Cuba - Organizacion de los Servicios y Nivel de Salud, Havana, 1974, p. 35.

6 See, for a description of the medical service in Cuba, Vincente Navarro, "Health, Health Services and Health Planning in Cuba," International Journal of Health Sciences, Vol. 2, No. 3, 1972, pp. 397-432.

7 Ministerio de Salud Publica, Cuba - Organizacion de los Servicios y Nivel de Salud, Havana, 1974, p. 49.

8 Ibid., p. 103.

9 Z. Stein and M. Susser, "The Cuban Health System: A Trial of a Comprehensive Service in a Poor Country," International Journal of Health Sciences, Vol. 2, No. 4, 1972, p. 555.

10 Dumont believes that both factors were involved. See Rene Dumont, Cuba: Socialism and Development, New York: Grove Press, Inc., 1970.

11 Ministerio de Salud Publica, Cuba - Organizacion de los Servicios y Nivel de Salud, Havana, 1974, pp. 113-114.

12 Ibid., pp. 111-112.

13 Ibid., p. 80.

14 Stein and Susser, op cit., p. 562.

15 A recent estimate places Cuba's life expectancy in 1960 at 64.1 years for both sexes combined, a level that would have been reached before the effects of the structural transformations could have been felt. The estimate is given in Alfonso Farnos Morejon, Cuba: Tablas de Mortalidad Estimadas por Sexo. Periodo 1955-70, Estudios Demograficos, Serie 1, No. 8, Universidad de la Habana, December 1976.

16 Jacques Vallin, "La Mortalite dans les pays du Tiers Monde: Evolution et Perspectives," Population, Vol. 23, No. 5, pp. 845-868.

17 It is of some interest to observe that the estimated Cuban suicide rate is almost twice as high as that of the other countries included in the table. Barring definitional and reporting biases, such differentials would not be inconsistent considering the serious social and familial dislocations resulting from a revolution as drastic and with such profound implications as that which has taken place in Cuba.

TABLE 1. HOSPITAL BEDS AND NUMBER OF BEDS PER 1000 INHABITANTS BY PROVINCE, CUBA, 1958 AND 1973

	1958		1973	
Province	Number of Beds	Beds per 1000 Population	Number of Beds	Beds per 1000 Population
Pinar del Rio	941	2.2	1,739	3.0
Havana	17,616	9.6	18,199	7.7
Matanzas	973	2.5	2,065	3.9
Las Villas	2,917	2.7	4,920	3.5
Camagüey	1,682	2.6	4,324	4.6
Oriente	4,407	1.9	9,772	3.0
Cuba	28,536	4.2	41,019	4.6

Source: Ministerio de Salud Publica, Cuba - Organizacion de los Servicios y Nivel de Salud, Havana, 1974, p. 38.

TABLE 2. LIFE EXPECTANCIES AT BIRTH FOR CUBA AND SELECTED REGIONS OF THE COUNTRY; 1953 AND 1970*

	1953	1970
Cuba	58.8[a]	70.2[c]
Havana Municipality	62.7[b]	-----
Havana Province		70.6[d]
Pinar del Rio Province		71.0[d]
Matanzas Province		71.6[d]
Las Villas Province		71.8[d]
Camagüey Province		68.8[d]
Oriente Province		69.4[d]

* Simple arithmetic averages of life expectancy estimates for males and females.

Sources:

[a] Fernando González and Jorge Debasa, Cuba: Evaluación y Ajuste del Censo de 1953 y las Estadisticas de Nacimientos y Defunciones entre 1943 y 1958. Table de Mortalidad por Sexo, 1952-54, Centro Latinoamericano de Demografia, Serie C., No. 124, Santiago, Chile, 1970.

[b] Sergio Diaz-Briquets, Mortality in Cuba: Trends and Determinants: 1880-1971. Unpublished Dissertation, University of Pennsylvania, Philadelphia, 1977.

[c] Centro de Estudios Demograficos, La Poblacion de Cuba. CICRED Series, Havana, 1976.

[d] Junta Central de Planificacion, Cifras sobre la Niñez y la Juventud Cubanas, Havana, September 1975, cited by Raúl Iapia, "La Dinamica de la Poblacion Cubana en el Siglo XX," CELADE, Internal Document, 1977.

TABLE 3. CAUSE-SPECIFIC DEATH RATES FOR SELECTED AMERICAN COUNTRIES, CIRCA 1970*

	Cuba	Argentina	Costa Rica	Chile	Panama	United States	Uruguay	Venezuela
All infective and parasitic diseases (000-136)	34.7	75.0	103.3	88.1	96.7	6.2	34.8	90.7
Enteritis and other diarrheal diseases (008-009)	14.3	31.4	55.1	42.0	33.5	1.2	13.6	44.0
Tuberculosis, all forms (010-019)	3.8	11.1	7.5	21.3	15.9	1.2	5.0	10.4
Malignant neoplasms (140-209)	76.5	90.7	73.4	85.9	46.4	77.1	101.2	61.2
Malignant neoplasm of trachea, bronchus and lung (162)	16.7	15.2	4.1	6.2	3.7	15.3	13.5	6.1
Diseases of the heart (390-429)	102.6	129.8	86.8	87.1	71.6	147.5	111.0	90.6
Cerebrovascular diseases (430-438)	40.5	48.8	30.1	50.3	34.5	38.8	56.9	32.9
Influenza and pneumonia (470-474, 480-486)	31.7	45.5	52.6	123.6	43.4	17.1	23.2	44.6
Complications of pregnancy (630-678)	3.5	6.1	6.0	8.2	8.7	.7	3.0	7.5
Symptoms and ill-defined conditions (780-796)	3.2	56.4	62.4	46.2	107.3	8.9	38.9	146.2
All accidents (E800-E949, E960-E989)	32.4	46.9	40.6	81.4	42.6	48.9	35.4	51.7
Suicide (E950-E959)	12.2	7.7	3.4	5.4	2.4	8.6	7.3	6.5
All causes**	4.8	7.1	6.3	8.1	5.9	4.8	5.9	6.9

* Cause-specific rates are shown per 100,000 inhabitants. They have been standardized to the Latin American population age distribution. The rates are for the two sexes combined. The causes are grouped according to the Eighth Revision of the International List of Causes of Death.

** The age-standardized death rate for all causes combined is shown per 1,000 population. The death rates have been standardized to the age distribution of the population of Latin America.

Source:

Pan American Health Organization (World Health Organization), Health Conditions in the Americas, 1969-1972, Washington, D.C., 1974, pp. 130-173.

TABLE 4. ESTIMATED LIFE EXPECTANCIES AT BIRTH FOR SELECTED NATIONS IN THE WESTERN HEMISPHERE CIRCA 1950 AND 1970; AND ESTIMATED PER CAPITA GROSS NATIONAL PRODUCT IN 1977

					Per Capita[f] Gross National Product - 1977
Cuba	(1953)	58.8[a]	(1970)	70.2[b]	800
Argentina	(1947)	60.6	(1970)	65.7	1590
Canada	(1951)	68.6	(1972)	72.7	6650
Chile	(1952)	50.2[c]	(1972)	62.8	760
Costa Rica	(1950)	55.5[c]	(1972)	67.8	910
Jamaica	(1953)	59.1	(1971)	66.7	1290
Puerto Rico	(1955)	67.8[d]	(1970)	72.1[e]	2300
Trinidad and Tobago	(1946)	54.1	(1971)	66.6	1900
United States	(1950)	68.3	(1971)	71.4	7060
Uruguay	(1950)	68.8	(1971)	68.1	1330
Venezuela	(1950)	52.6	(1972)	66.4	2220

Sources:

[a] Debasa and Rodriguez, op cit.

[b] Centro de Estudios Demograficos, La Poblacion de Cuba, CICRED Series, Havana, 1976.

[c] Eduardo E. Arriaga, New Life Tables for Latin American Populations in the Nineteenth and and Twentieth Centuries, Population Monograph Series, No. 3, University of California, Berkeley, 1968.

[d] United Nations, Demographic Yearbook, New York, 1966.

[e] United Nations, Demographic Yearbook, New York, 1974.

[f] World Population Data Sheet - 1977, Population Reference Bureau, Washington, D.C.

All others from the Pan American Health Organization, Health Conditions in the Americas, 1969-1972, Washington, D.C., 1972.