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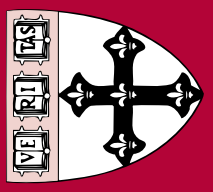

Dimensions and Determinants of Mortality Decline in Pre-Revolutionary Cuba

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Abstract

Revolutionary Cuba since 1959 has outpaced most other Latin American countries at raising life expectancy and reducing infant mortality. Pre-revolutionary Cuba from 1900 to 1959 did even better, however, outperforming all other Latin American countries for which data are available. Pre-revolutionary Cuba became Latin America's unlikely champion of mortality decline despite experiencing slow economic growth and high income inequality, a record that is inconsistent with the "wealthier is healthier" interpretation of mortality reduction. It also achieved this distinction despite being ruled by governments that are sometimes portrayed as corrupt, personalistic, patronage-ridden, subordinate to US business interests, and neglectful, at best, of the exploited and downtrodden. We attribute pre-revolutionary Cuba's rapid mortality decline to the accessibility of its health care system to a large fraction of the poor, and to features of the island's history, geography, labor union movement, and political system that contributed to this accessibility.

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Cuba has done well at expanding the survival-related capabilities of its citizens. The government newspaper Granma reported in early January 2003 that infant mortality per 1000 live births in 2002 was "¡6.5!," up slightly from "¡6.2!" in 2001 (de la Osa 2002; 2003). In 2002, the infant mortality rate in the United States was 7.0 per 1000 (Kochanek and Martin 2004). For Cuba to have an infant mortality rate lower than that of the United States is a remarkable achievement. In 1996, the most recent year for which data are available, Cuba's GDP per capita at purchasing power parity was $5,259, compared to $29,194 in the United States (Heston, Summers, and Aten 2002).

The revolutionary government that has ruled Cuba since 1959 is proud of its universalistic and egalitarian social policies. Cuba's leaders consider the infant mortality rate to be a telling indicator of how these policies have helped the population (Benjamin, Collins, and Scott 1984: 96; Feinsilver 1993: 51-52, 94). Castro and his colleagues have reason to be proud of these policies and their effects. In 1995, the most recent year for which comparable, high-quality data are available, Cuba had the lowest infant mortality rate in Latin America. The revolutionary government's expansion of health care, family planning, education, sanitation, and water provisioning among the poor, together with its redistribution of income in favor of the poor, contributed decisively to this achievement (Díaz-Briquets 1983: 125; Drèze and Sen 1989: 249-250; Feinsilver 1993; Mehrotra 1997).

Compared to other Latin American countries, however, Cuba since 1959 has done well, rather than extremely well, at reducing infant mortality. Although revolutionary Cuba is often assumed to be way out ahead of the rest of the region on the mortality front, other Latin American countries have done at least as well as Cuba at reducing the risk of early death. The problem is not with Cuba's statistics, which are defined conventionally and are among the most complete and accurate in the world. Rather, it is that Cuba's reputation is based on the levels of life expectancy and infant mortality it had achieved in 1995, rather than on its progress at improving these indicators from 1960 to 1995. During this period, the longest for which high-quality comparable data are available, Cuba ranked fifth of 20 Latin American countries at progress at reducing infant mortality, and fourth among 20 at progress at raising life expectancy (Table 5, below).

Cuba's low level of infant mortality in 1995 was more impressive than its progress at reducing infant mortality from 1960 to 1995 mainly because the island started out in 1960 with a low infant mortality rate. This rate, 39 per 1000, was the lowest in Latin America, and was lower than the rates in 1960 in Italy or Spain (both of which wound up with rates below Cuba’s in 1995). Cuba's lead over other Latin American countries in lowness of infant mortality was even wider in 1960 than in 1995, and Cuba's progress relative to other Latin American countries at reducing infant mortality was even greater from 1900 to 1960 than from 1960 to 1995. During the earlier period, Cuba led all Latin American countries

for which data are available at raising life expectancy and reducing infant mortality (Table 6, below). In short, compared to other Latin American countries, Cuba did at least as well at reducing premature mortality before the revolution as after it.

It might be objected that additional infant mortality decline gets harder as the absolute level of infant mortality gets lower, such that revolutionary Cuba was handicapped in a way that pre-revolutionary Cuba was not. This objection would be persuasive if the indicator of progress used in the comparison were the absolute decline of the infant mortality rate. In fact, however, the indicator used is percent decline, as is customary in comparisons of mortality reduction when initial levels differ. Using the percent decline indicator, a drop from 10 to 9 per 1000 gets exactly as much credit as a drop from 100 to 90 per 1000 (10 percent in each case). The claim that it is "easier" to achieve this 10 percent decline by reducing the rate from 100 to 90 per 1000 than from 10 to 9 per 1000 is hard to sustain. In the first case an absolute decline of 10 per 1000 is required; in the second case the required drop is only 1 per 1000. It is not self-evident that the former reduction can be achieved more cheaply than the latter, and even if it could be, "cheaper" is not the same thing as "easier." Countries with infant mortality rates of 100 per 1000 tend not only to have lower GDPs per capita, but also lower administrative capacity. A program in a rich country to stop drug and alcohol use by expectant mothers might achieve a decline from 10 to 9 per 1000; a program in a poor country to educate traditional midwives about hand-washing might achieve a decline from 100 per 90 per 1000. The latter program would not obviously be cheaper than the former program, and it would probably put more strain on available administrative resources.

It might also be objected that the revolutionary government had to overcome another handicap that did not burden its predecessors, namely the departure shortly after 1959 of about 3,000 of the country's 6,000 doctors (Feinsilver 1993: 157) and of a disproportionately wealthy sector of the population (Eckstein and Barberia 2002: 802-803). The flight of doctors may have posed a less serious challenge than it seems at first thought. The number of doctors per 10,000 inhabitants fell only from 10.0 in 1957 to 8.3 per 1000 in 1964, suggesting that many departing doctors were soon replaced. During the same period, moreover, per 10,000 inhabitants, the number of nurses rose from 4.5 to 8.1, the number of nurses' aides rose from 2.0 to 2.8, and the number of hospital beds rose from 26 to 55 (PAHO 1988: 32, 70, 86, 118). The flight of the affluent probably did leave behind less healthy population, but from 1959 to 1970 only 3-4 percent of the Cuban population emigrated to the United States (calculated from Schroeder 1982: 112), so the effect of this emigration on the island's mortality level was probably small. Moreover, the emigrants contributed to state resources both by leaving behind their properties, which were typically seized by the government, and by sending cash and goods back to the island (Eckstein 1994: 32, 69-70).

To point out that pre-1959 Cuba did well at reducing infant mortality is not to imply that the revolutionary government has neglected or failed to attain this aim. On the contrary, Castro's government has made strenuous efforts to reduce infant mortality, perhaps even overinvesting in this goal (Alonso, Donate-Armada, and Lago 1994). Its policies have been very successful, even during a deep economic crisis in the early 1990s (Barraclough 2000; Chomsky 2000). The government deserves credit for this achievement, and other countries, including the United States, have much to learn from it. It is not really surprising, however, that a government so firmly committed to reducing infant mortality should find the goal within reach. More remarkable is the progress that Cuba made before 1959, when it was ruled by governments that are sometimes portrayed as corrupt, personalistic, patronage-ridden, subordinate to US business interests, and neglectful, at best, of the exploited and downtrodden. Making this rapid mortality decline even more remarkable, the island from 1900 to 1959 experienced slow economic growth and high income inequality. How did Cuba manage to do so well at reducing mortality under these apparently inhospitable conditions?

The explanation lies partly with overall modernization, especially with fertility and urbanization, but Cuba's advantages in these areas, compared to other Latin American countries, were offset by handicaps in the areas of GDP per capita growth, which was sluggish, and income inequality, which was high. Our explanation highlights pre-revolutionary Cuba's health care system, which was accessible to an unusually large fraction of the poor, and aspects of the island's history, geography, labor union movement, and political system that contributed to this accessibility. These features were distinctive in the Latin American context, and there is a plausible story, backed by some evidence, as to how each of them might have helped the country achieve rapid mortality decline.

We begin by depicting the pace and pattern of mortality decline in Cuba from 1900 to 1960. The first section of the paper assesses the sources and quality of Cuban mortality data and chooses the best estimates levels of life expectancy and infant mortality in 1900, 1960, and 1995. The second section compares Cuba's progress at reducing premature mortality to that of other Latin American countries both before and after the 1959 revolution and identifies speedups and slowdowns in the pace of mortality decline from 1900 to 1960. We then proceed to sort through possible reasons for Cuba's rapid mortality decline from 1900 to 1960. The third section assesses the impact of modernization factors like GDP growth and fertility change on the pace of mortality decline; the fourth section explores the effects of social policies like education and health care. The fifth section traces Cuba's success at reducing premature mortality to mosquito control in the first decade of the 20th century; to a bountiful supply of physicians (particularly after 1945); and to aspects of the country's history, geography, social structure, and class organization that seem to have made health care more accessible to the poor than elsewhere in Latin America.

1. Life Expectancy and Infant Mortality in 1900, 1960, and 1995

Mortality estimates are typically derived from vital registration records, census data, or sample surveys. Vital registration records usually permit more direct and timely estimates of mortality rates than do census or survey data, provided that they use a standard definition of infant death, and provided that they are nearly complete and accurate. The first condition did not hold in Cuba until 1957, and the second did not prevail until the late 1960s.

1.1. Vital Registration Statistics, 1884-1959

Cuba's vital registration system got off to an early start. In 1884, the Spanish colonial authorities passed one of Latin America's earliest laws requiring the registration of births, deaths, and stillbirths (United Nations 1955: 20-21; Rios Massabot 1983: 17). From that time until at least the late 1950s, however, Cuba's vital registries had serious deficiencies.

One problem was definition. Before 1957, a death in the first 24 hours of life entered Cuba's vital registries, if at all, as a late fetal death rather than an infant death (González Quiñones and Debasa 1970: 5; Cuba. JUCEPLAN/DCE 1974: 84; United Nations 2000). Spain, France, Belgium, and the Netherlands at this time also recorded deaths in the first 24 hours after birth as late fetal deaths rather than infant deaths (United Nations 1955: 48, 231). Indeed, as late as the 1990s, in France the death of an infant before the registry of its birth (which could take up to 48 hours) was recorded as a late fetal death rather than an infant death (Liu et al. 1992: 107; United States Congress 1994: 35). In 1957, however, Cuba began to count deaths in the first 24 hours of life as infant deaths, and in 1965 it adopted the standard World Health Organization definitions of live birth, infant death, and fetal death (Cuba. JUCEPLAN 1975: 141; Catasus Cervera and Hernández Castellón 1977: 282 n. 3; Rios Massabot 1983: 17, Riverón Corteguera 1996).

A second problem was that parents until 1967 were legally allowed to wait as long as a year before registering a birth, as opposed to 60 days in Chile, 25 days in Costa Rica, and 3 days in Argentina (United Nations 1955: 84, 170). When an infant dies before his or her birth has been registered, parents are much less likely to register either the birth or the death (Hill 1991: 369). The death and birth go similarly unreported, but because infant deaths are rarer than births, omitting the death matters more to the size of the numerator than omitting the birth matters to the size of the denominator. Hence, the net effect of the dual omission is to reduce the calculated infant mortality rate. The long delay that was legally permissible in registering a birth thus exacerbated the underregistration of infant deaths. The problem persisted until 1967, when a new law reduced the reporting period to 20 days and required health personnel to register the births and, if necessary, the deaths of infants whose parents were unwilling or unable to do so (Rios Massabot 1983: 17-18).

A third problem with Cuban death registration in the pre-revolutionary era is that births and deaths were recorded by place of occurrence rather than by place of residence. Argentina, Brazil, Chile, and Costa Rica had a similar practice (United Nations 1955: 78). Hence, mortality rates in the city and metropolitan area of Havana may have been "inflated by the deaths of non-residents who sought Havana's medical facilities" (Diaz-Briquets 1981: 400; Díaz-Briquets 1983: 142-143).

The biggest shortcoming of Cuban mortality statistics in the pre-revolutionary era was, however, their incompleteness. In the city of Havana from 1901 to 1951, and possibly as far back as 1835, death registration is thought to have been virtually complete (Foreign Policy Association 1935: 95-97; Díaz-Briquets 1981: 400). The same cannot be said for the rest of the country. González Quiñones and Debasa (1970: 14) used data from the 1943 and 1953 censuses to estimate the degree of incompleteness of death records across the country as a whole in 1947, 1948, and 1949. They found that only about 57 percent of all deaths, and only about 36 percent of under-5 deaths, had found their way into the vital registries. Those who died without medical certification, and infants who survived for less than 24 hours, were omitted from the registries. A scarcity of registration facilities contributed to the incompleteness of death records outside Havana. Of 13 Latin American countries in the early 1950s, Cuba had the lowest ratio of birth and death reporting facilities to population (United Nations 1955: 66).

1.2. Infant Mortality and Life Expectancy around 1900

Death registries were even less complete in the first few decades of the twentieth century than in the late 1940s (Díaz-Briquets 1983: 141). Because the death registries cannot be trusted, most scholars have used census data to estimate infant mortality and life expectancy in Cuba around 1900. Tables 1 and 2 depict the available estimates for 1899 and 1900. Of the estimates of infant mortality around 1900, González Quiñones and Ramos Piñol's (1996) estimate of 195 per 1000 in 1900-04 (Column 4) seems closest to the mark. Hollerbach and Díaz-Briquets (1983: 5) found that the series reprinted by Catasus Cervera and Hernández Castellón (1977), which appears in Column 3 of Table 1, overstated the true mortality rate. If so, the estimate for 1899 in Column 2 is also overstated, and the estimate in Column 1 is greatly overstated. Losada (1999: 197 n. 50), who provided the Column 1 estimate of 265 per 1000 in 1899, took it from registered death records, arguing that vital registries probably improved under the US occupation from 1899 to 1902. Still, if Hollerbach and Diaz Briquets are correct that an estimate of 224 per 1000 overstates the infant mortality level in 1899, an estimate of 265 per 1000 would overstate it even more.

[Insert Tables 1 and 2 About Here]

On the other hand, Hollerbach and Díaz-Briquets (1983: 8) regard Collver's (1965) estimates of Cuban infant mortality (Table 1, Column 5) as too low. Indeed, Collver's estimates are lower in many

years the vital registration figures in Column 8, which are known to be incomplete. The Havana series from Díaz-Briquets (Table 1, Columns 6 and 7) are useful for tracing the evolution of infant mortality after 1900, and for measuring the evolution of infant mortality in Havana itself, but less so for estimating the level of infant mortality across the whole country in 1900. Not only were death records more complete in Havana than elsewhere; the better health services and sanitary conditions in Havana also attracted ill people and expectant mothers anticipating difficult births. Any deaths that resulted were counted as occurring Havana, the municipality (province) where they took place, rather than being attributed to the province where the deceased, or the mother of the deceased newborn, usually resided. Hence, the Havana infant mortality rate would be overstated, and that of the other provinces understated, at least from the point of view of the success of each province at expanding the survival-related capabilities of its inhabitants. At the same time, the reality of the better health services and sanitary conditions held the mortality rates of Havana residents below those of the residents of other provinces. It is possible that these effects balanced each other out, or that one was considerably stronger than the other, and it is also possible that the balance between them changed over time.

Among all of these alternative estimates of infant mortality in 1900, we accept González Quiñones and Ramos Piñol's (1996) 195 per 1000. It was produced in a transparent and systematic fashion and is thereby open to replication and critique, and it splits the difference between the estimates of Collver and Catasus/Hernández, which in the judgment of Hollerbach and Díaz-Briquets (1983: 5) are too low and too high respectively.

Less variation is apparent in the fewer available estimates of life expectancy around 1900. We shall accept Astorga and FitzGerald's (1998) estimate that life expectancy at birth in Cuba in 1900 was 32 years (Table 2, Column 4), not far from the alternative estimate of 33.2 years (Table 2, Columns 1 and 2). We prefer Astorga and Fitzgerald (1998) to this alternative estimate because Astorga and Fitzgerald provide the estimates of life expectancy for the other countries to which Cuba is compared in Section 2.

1.3. Infant Mortality and Life Expectancy around 1960

Cuba's infant mortality level in 1960 is a matter of some controversy. The higher the infant mortality rate in Cuba in 1960, the easier it is to credit the revolutionary government with significant progress at reducing infant mortality. Accordingly, an article in the official newspaper of the US Communist Party assigns Cuba an infant mortality rate of 65 per 1000 in 1960 (Wheeler 1997), and others sympathetic to the revolution suggest the plausibility of rates as high as 125 per 1000 (Benjamin, Collins, and Scott 1984: 96). At the other extreme, the US Department of State assigns Cuba an infant mortality rate of only 32 per 1000 in 1960 (Bureau of Inter-American Affairs 2002), below the reported rate in West Germany (World Bank 2002).

Columns 1-3 of Table 3 present three different series of infant mortality rates, all based on vital registration statistics. Columns 2 and 3 explicitly count infants dying in the first twenty-four hours of life as infant deaths. It is not known for certain how such deaths are counted in Column 1, but our guess is that they are counted as infant deaths in this source as well. In any case, the 32 per 1000 estimate for 1960 published by the US Department of State (Bureau of Interamerican Affairs 2002) is much lower than any of the estimates in Columns 1-3, which are also based on vital registration statistics and which hover around 36 per 1000. The slightly higher estimates of infant mortality in Columns 4 and 5 are based on vital registration records which have been revised upward to compensate for the presumed underregistation of infant deaths. Neither of the sources of the data in Columns 4 and 5 explains the basis of such revisions, but each produces an estimate for 1960 that is very close to the Hill et al. (1999) estimate of 39 per 1000, which is regarded here as the best available. The Hill et al. (1999) estimate itself is based on a knotted regression line that minimizes the squared distance between itself and three other estimates: an uncorrected vital registration estimate of 37 per 1000 (United Nations 1992: 104), and the 1974 and 1979 survey estimates recorded in Columns 6 and 7. The survey data closely corroborate the corrected vital registration figures, and reassure us that the Hill et al. (1999) estimate of 39 per 1000 is in the neighborhood of the actual rate.

[Insert Table 3 About Here]

The estimates for 1960 in columns 9 and 10 of Table 3, which hover near 60 per 1000 (much higher than the Hill et al. estimate of 39 per 1000), are based on life tables calculated from data in the 1953 and 1970 censuses. The figures in these life tables are interpolated to generate estimates of age-specific death rates in intervening years, including 1960. Farnos Morejón (1977) describes the specific method used to generate the figures in Column 9. The figures in Column 10 are produced by a similar method, except that Gonzales Quinones and Ramos Piñol (1996: 31) incorporate new data on migration; correct for an apparent census undercount of under-5 children; and use the method of inverse projection (McCaa 2001). The figures in Column 11 are taken from a CELADE study that provides no information about methodology, but seem to be derived from census data. These higher estimates of infant mortality are problematic. The long interval between the 1953 and 1970 censuses makes projections for 1960 necessarily imprecise. Moreover, none of the sources in Columns 9-11 engages the earlier, readily available, and much lower estimates in the other columns -- either the corrected vital registration estimates in Columns 4 and 5, or the survey estimates in Columns 6 and 7. Also boosting confidence in the Hill et al. (1999) estimate of 39 per 1000 for 1960, Granma, the official newspaper of the Cuban revolutionary government, recorded the 1960 infant mortality rate as 37.3 per 1000 in two consecutive years (de la Osa 2002, 2003). The Cuban government would seem to have an interest in endorsing a higher estimate. That way, the amount of infant mortality decline since 1959 would look bigger.

More agreement exists on life expectancy than on infant mortality in 1960. The three sources for 1960 in Table 2 concur that a newborn in 1960 could expect to live about 64 years. The mean of the CEPAL/CELADE estimates (Column 7) for 1955-1960 and 1960-1965 is 63.9 years. Díaz-Briquets (1983: 19) accepts an estimate of 64.0 years for 1960, and the World Bank (2002) provides an estimate of 64.2 years for 1960. We therefore accept that the infant mortality rate in Cuba in 1960 was about 39 per 1000, as Hill et al. (1999) suggest, and that life expectancy at birth was about 64 years.

1.4. Infant Mortality and Life Expectancy around 1995

Cuba's infant mortality rate in 1995 was reported to be 9 per 1000, the lowest in Latin America (Hill et al. 1999). Life expectancy at birth was reported to be 75.8 years, second-highest in the region after Costa Rica (76.2) (World Bank 2002). Cuba's infant mortality rate in 1995 is more controversial than its level of life expectancy, perhaps because its infant mortality rate is updated every year and is calculated directly from government vital statistics. Cuban definitions of infant mortality and laws about birth and death registration have met international standards since the late 1960s, but critics have alleged that infant mortality statistics under Castro have been "fudged" or that they have been artificially biased downward, either by the underreporting of the births and deaths of very low birthweight babies or by a high abortion rate.

In an article entitled "Did Fidel Fudge the Figures?", Nicholas Eberstadt (1986: 38) noted that "Cuban authorities [may be] deliberately falsifying statistics on their nation's infant mortality rate," and pointed to other instances in which the government apparently falsified official statistics. Lawrence Solomon (2003) wrote that "Castro's accomplishments are a hoax; his statistics have been fudged or fabricated," and argued that the government had covered up an outbreak of dengue fever in 1997. Both Eberstadt and Solomon cite a study by Kenneth Hill (1983) that found large differences from 1974 to 1978 between infant mortality rates calculated from vital registration statistics, and those estimated indirectly from child survivorship questions asked in the 1979 Demographic Survey. In 1978, infant mortality was 22 per 1000 according to vital statistics (de la Osa 2003), but 38 per 1000 according to indirect estimates based on the 1979 Demographic Survey (United Nations 1992: 105). Indirect estimates based on the 1987 Fertility Survey produced similarly high figures, 36 per 1000 for 1976 and 32 per 1000 for 1978. This survey, however, also produced estimates of 42 per 1000 for 1981 and 9 per 1000 for 1985 (United Nations 1992: 106). Such huge apparent changes over such a short span of time cast doubt on the survey's reliability.

[Insert Table 4 About Here]

Neither Eberstadt nor Solomon give any direct evidence that the Cuban government has falsified its infant mortality statistics. Moreover, observation of a discrepancy between vital statistics and survey

results does not entail the conclusion that the vital statistics are flawed whereas the survey results are accurate. Hill et al. (1999: 70) regard the estimates from the 1987 Fertility Survey as severely flawed, and give them zero weight in their own estimates. Hill (1983: 89-92) views the vital registration-based estimate for 1978 (22 per 1000) as more credible than the estimate based on the 1979 Demographic Survey (38 per 1000), in part because the survey based its estimate on responses from women aged 15 to 19 (United Nations 1992: 105). Such women tend to be poorer than average, and tend to be bearing their first child, both of which are risk factors for infant death. Moreover, the number of births to 15-19 year-old women in sample surveys is often very small, making estimates based upon them unreliable (United Nations 1992: 7).

What about the possibility that Cuba uses a non-standard definition of infant mortality that yields a lower rate than the standard definition? Until 1957, as noted earlier, an infant had to survive for at least 24 hours to be counted as a live birth; a death in the first twenty-four hours of life was recorded as a late fetal death. In 1957, however, as noted above, Cuba effectively ended this practice, and in 1965 it formally adopted the World Health Organization definitions of live birth, infant death, and fetal death. Hence, Cuba since 1957 has used the standard definition of an infant death.

The vital registries improved after 1959 as the revolutionary government streamlined data collection, established new centers for processing death certificates, rehabilitated existing centers, and trained personnel (Mesa-Lago 1969; Cuba. JUCEPLAN 1975: 141; Catasus Cervera and Hernández Castellón 1977: 282 n. 3; Rios Massabot 1983: 17). Also improving the completeness of infant death registration, the share of births taking place in medical facilities rose from 63 percent in 1963 to 98 percent in 1972 (Riverón Corteguera, Valdez Lazo, and Rodríguez Castro 1978: 413, Rios Massabot 1983: 17; Santana 1988: 109). Between 1960 and 1966, accordingly, the unadjusted vital registration estimates begin to approach the adjusted estimates (Table 4, Columns 3 and 4; Landstreet 1976: 108). In April 1975, the Cuban government told the United Nations that its birth and death (including infant death) statistics could be regarded as complete as of 1967 and 1969 respectively (Landstreet 1976: 102).

Most observers agree that vital-registration based infant mortality statistics in Cuba have been acceptably complete and accurate at least since the late 1960s (Mesa-Lago 1969: 76; Landstreet 1976: 102; Rojas Ochoa and Sánchez Texidó 1977; Díaz-Briquets 1986: 10; Santana 1988; Drèze and Sen 1989: 186 n. 13; Feinsilver 1993: 97-98). International agencies concur with this evaluation. In March 1974, a researcher for the Pan American Health Organization concluded from several types of evidence that Cuban vital statistics were substantially complete, and recommended that the WHO label them as such in its official publications (Santana 1988: 108). Cuba from 1965 to 1970 averaged 54,000 recorded deaths, very close to 53,000 expected by researchers at the Centro Latinoamericano de Demografía (CELADE). In each year from 1970 to 1975, Cuba similarly recorded between 49,000 and 54,000 deaths

(CELADE 1977: 16). The Pan American Health Organization (PAHO) estimated that Cuban vital registries in 1985-1990 recorded at least 90 percent of births, infant deaths, and child deaths, a proportion as high as the United States. Another PAHO study estimated that Cuban registries in 1996 recorded 99.9 percent of all deaths, more than the 97.2 percent in the United States (McGuire 2001: 1679).

Although most observers and international agencies agree that Cuba's vital registration statistics were complete and accurate during the 1990s, some claim that Cuba underreports the births and deaths of newborns weighing less than 1500 grams. In 2000, the mortality rate for US infants weighing less than 1500 grams was 247 per 1000, nearly 100 times as high as that for infants weighing 2500 grams or more (2.5 per 1000) (United States CDC 2002: Table 21). Three studies carried out in individual Cuban hospitals during the 1990s found similar mortality rates of 192 per 1000 (Cárdenas Rivero et al. 2001), 247 per 1000 (Enríquez Clavelo et al. 1999), and 261 per 1000 (Navarro Ruíz and Molina Hernández 1999) for infants weighing less than 1500 grams.

Very few newborns weigh less than 1500 grams, but their extremely high death rate means that the completeness of reporting of their births and deaths can have a pronounced effect on the infant mortality rate. In comparing the reported proportion of very low-birthweight infants in Cuba to the proportion in the United States, Carnell (2002) implies that US reporting of the births and deaths of such infants is virtually complete, whereas Cuban reporting suffers from widespread omissions. This possibility is worth taking seriously, for cross-national differences in birth and death reporting of very low-birthweight infants complicate infant mortality comparisons even among rich countries (Howell and Blondel 1994; United States Congress 1994: 34-35; Kramer et al. 2002).

Lending initial plausibility to Carnell's claim, the reported share of very low-birthweight babies was higher in the United States in 2000 (1.4 percent; United States CDC 2002: Table 15) than on average in three Cuban hospitals during the 1990s (calculated from Enríquez Clavelo et al. 1999; Navarro Ruíz and Molina Hernández 1999; and Cárdenas Rivero et al. 2001). Combining the results of the three studies, 451, or 0.6 percent, of 71,618 babies reported to have been born alive in the three hospitals put together weighed less than 1500 grams. Maternal health, however, rather than reporting differences, may explain some of the gap between the US and Cuban incidence of very low-birthweight births. In 1995 inequalities of income, education, nutrition, and access to health care were greater in the United States than in Cuba, and disadvantaged mothers in the United States may well have been in poorer health than disadvantaged mothers in Cuba. In Sweden, where the social safety net is stronger than in the United States, the share of births under 1500 grams in the early 1990s was only 0.7 percent (Howell and Blondel 1994: 851), close to the average reported rate in the three Cuban hospitals. Moreover, the reported share of very low birthweight births in the United States is perhaps itself understated. Underreporting of the births of infants

weighing less than 1500 grams has been found on American Indian reservations (Heck, Schoendorf, and Parker 1999).

Even if the differential between the share of US and Cuban births under 1500 grams were due entirely to underreporting in Cuba, raising the infant mortality rate to compensate for the omissions would probably not change the main findings of the present study. A simulation by Howell and Blondel (1994: 851) found that an increase in the share of births under 1500 grams from 0.5 to 1.0 percent would raise a perinatal mortality rate of 15.0 per 1000 only to 17.3 per 1000 (perinatal mortality encompasses fetal deaths after 28 weeks plus infant deaths under 7 days). In 1996, Cuba's perinatal mortality rate was 12.4 per 1000 (PAHO 2001) and its infant mortality rate was 7.9 per 1000 (Table 4). Hence, even if the true proportion of very low-birthweight babies in Cuba were considerably higher than the official statistics report (a claim not conceded here), Cuba's infant mortality rate in 1996 might have been about 9 per 1000 rather than 8 per 1000 -- still the lowest in Latin America, and just above the 7 per 1000 rate in 1996 in the United States.

Díaz-Briquets (1986: 40-41) has called attention to Cuba's high rate of abortion, which implies the termination of some pregnancies that might otherwise have resulted in births of vulnerable infants. In 1996, Cuba indeed had, after Vietnam, the highest abortion rate in the world, with nearly four times the US ratio of abortions to pregnancies (Henshaw, Singh, and Haas 1999: 534). Feinsilver (1993: 101-02) writes that a high rate of abortion following genetic diagnosis "has given Cuba an advantage over others in the race to decrease the infant mortality rate," and adds that "given the intense effort to decrease infant mortality, it is possible that, the free-choice abortion policy aside, many doctors may strongly advise and even pressure for abortion." Feinsilver also reports, however, that genetic diagnosis followed by abortion reduced infant mortality by less than 1 per 1000 at a time when the official rate was 10 per 1000. A study of the decline in US neonatal mortality (deaths within the first 28 days of life) from 1964 to 1977 produced even lower estimates of the abortion effect. The study found that the rise in availability of abortion services reduced neonatal (birth to 28 days) mortality by about 1 per 1000 among blacks (whose neonatal mortality rate fell from 28 to 16 per 1000 over the period) and by about 0.2 per 1000 among whites (whose rate fell from 16 to 9 over the period) (Corman and Grossman 1985: 232-33). Hence, although Cuba's high abortion rate may contribute to its low infant mortality rate, the substantive impact of such a contribution is probably small. Cuban doctors also often discourage pregnancies by women who are above the usual childbearing age or who already have several children, thereby reducing the proportion of high-risk births, but the provision of such advice does not amount to a cynical "tweaking" of the country's infant mortality statistics.

Cuba's official infant mortality estimate for 1995, 9.4 per 1000 (de la Osa 2003), is based on a standard definition of infant mortality and on reasonably complete and accurate vital registration

statistics. Accordingly, we accept the Hill et al. estimate that infant mortality in 1995 was about 9 per 1000. A high rate of abortion contributed to the low infant mortality rate, but probably not much. As for life expectancy at birth in 1995, alternative estimates do not differ appreciably. The mean of CEPAL/CELADE's estimates for 1990-1995 and 1995-2000 is 75.7 years (2002: 22); the World Bank's (2002) is 75.8 years; and Astorga and FitzGerald's (1998: 32) is 76 years. It seems reasonable to conclude that Cuba's infant mortality rate in 1995 was about 9 per 1000, and that its life expectancy at birth was about 76 years.

2. Cuban Mortality and Mortality Decline in Comparative Perspective

Levels of infant mortality and life expectancy reflect decades or even centuries of ecological challenges, social contexts, institutional arrangements, and government policies. Progress over time at reducing premature mortality, by contrast, reflects shorter-term changes in socioeconomic conditions, institutional arrangements, and government policies that reduce the risk of early death. We are therefore interested not only in the levels of premature mortality that Cuba and other Latin American countries had achieved in 1900, 1960, and 1995, but also in the relative progress that each country made at raising life expectancy and reducing infant mortality in the intervening years, as well as in the tempo of mortality decline within each of these periods.

As far as mortality levels go, Cuba did well in both 1960 and 1995 at achieving a low level of premature death (Table 5). On infant mortality, Cuba led the region in both years, but by a greater margin in 1960 than in 1995. On life expectancy, Cuba came in third in 1960 and a close second in 1995. Where Cuba really excelled before the revolution, however, was in the progress it made at reducing mortality. From 1900 to 1960, Cuba enjoyed the sharpest percent rise in life expectancy and sharpest percent decline in infant mortality of any Latin American country for which information is available (Table 6). Indeed, Cuba probably surpassed the other countries at reducing infant mortality by an even greater margin than is suggested by the figures in Table 6, because Cuba's infant mortality rate in 1900, as was argued in Section 1.2, was probably closer to 195 per 1000 than to Collver's (1965) estimate of 136 per 1000. If the true initial rate in 1900 were 195 rather than 136 per 1000, Cuba's decline from 1900 to 1960 would be 80 rather than 71 percent, giving it an even wider lead over the other countries.

[Insert Tables 5 and 6 About Here]

Collver's estimates of the infant mortality rate in other Latin American countries around 1900 may also be understated, but his figures for Argentina and Costa Rica, and to a lesser extent Chile, coincide fairly closely with estimates based on vital registration (which, although flawed, was more complete in these countries than in Cuba). According to vital registration records, Argentina's infant mortality rate in 1911 was 148 per 1000 (Mitchell 1998: 87-88), near Collver's estimate of 146, and Costa

Rica's was 197 in 1910 (Rosero-Bixby 1985: 365-66), close to Collver's estimate of 208. Chile's rate according to vital statistics -- 340 in 1901 and 270 in 1902 (Mamalakis 1980: 40-41) -- was higher than Collver's estimate of 261, but even if this very high 340 per 1000 figure were accepted (the mean infant mortality rate in Chile from 1902 to 1906 was only 293 per 1000, closer to Collver's estimate), Chile's reduction of shortfall from 1900 to 1960 would be 65 percent -- more than the 55 percent in Table 6, but still below Cuba's 71-80 percent. Likewise, infant mortality in Mexico according to vital registration statistics was about 265 per 1000 in 1900, and averaged 297 per 1000 from 1900 to 1909 (Feliciano 2000: 605-606). These estimates are higher than Collver's estimate of 220 per 1000. Substituting these alternatives for Collver's estimate for Mexico yields a reduction of shortfall from 1900 to 1960 of 64-68 percent, still below Cuba's.

Compared to other Latin American countries, then, Cuba's level of infant mortality was even more exceptional in 1960 than in 1995, and its progress at reducing infant mortality was even more exceptional before the revolution than after it. Instructive comparisons can also be made across time periods within Cuba. The lack of fine-grained time series precludes rigorous quantitative analysis, but the tempo of mortality decline from the beginning of the twentieth century until the revolution can be traced in broad outline, mainly through census data, and then juxtaposed to the evolution of indicators of modernization and of social service provisioning, in order to gain insight into the relative weight of the various factors that contributed to mortality decline from 1900 to 1960.

The Spanish American War was a catastrophe for Cuba, reducing the population from 1.8 million in 1895 to 1.5 million in 1898. The decline resulted partly from a fall in the birth rate, but in 1897-98 "war, starvation, and pestilence killed one person in ten in a single year" (Foreign Policy Association 1935: 97). The share of the Cuban population that died during the Spanish-American War has been compared to the share of the Soviet population lost in World War II (Thomas 1971: 423 n. 36). Over the next six decades, however, mortality fell rapidly, especially after 1943. Díaz-Briquets (1983: 21), reviewing data for Cuba as a whole and for the city of Havana, found that "mortality declined gradually during the first two decades of [the twentieth] century. The decline gained momentum in the 1920s, may have slowed down during the 1930s, and accelerated rapidly after the Second World War. That rapid decline seems to have continued through the 1960s." Since Díaz-Briquets wrote his pioneering work, researchers have produced new infant mortality and life expectancy series that allow us to re-examine his depiction of the tempo of mortality decline from 1900 through the 1960s. Rather than picking one series as the most accurate and discarding the others, we take the average of all the series using a method, illustrated in Appendix 1, that involves converting each column in Table 1 (infant mortality), as well as in Table 2 (life expectancy), to a series of annual percent decline figures, and then taking the average of the values in each row.

The results of these exercises for infant mortality and, to a lesser extent, life expectancy suggest that the tempo of mortality decline in Cuba from 1900 to 1960 is close to the one traced by Díaz-Briquets. Infant mortality (Table 1, Column 8) fell slowly from 1900 to 1920 (at an annual rate of 1.3 to 1.6 percent), then faster from 1921 to 1930 (at an annual rate of 2.0-2.5 percent). The pace of decline then slowed in the early 1930s before speeding back up from 1936 to 1943 and especially from 1944 to 1960 (when the annual rate of decline reached 3.6-4.3 percent). Life expectancy (Table 2, Column 8) showed a broadly similar trend, except that no slowdown in the rate of increase was visible during the 1930s. The bottom line for both indicators is that the pace of mortality decline was rather slow from 1900 to 1920, but relatively fast from 1945 to 1960.

Díaz-Briquets (1983: 67-101) has analyzed, within the limits of the available data, the decline in mortality from specific causes in Cuba from 1899 to 1953. Unlike in Sri Lanka (Livi-Bacci 2001: 138), Taiwan (Yip 2000: 123), or Thailand (Muscat 1990: 87-89), no plunge in malaria seems to have propelled the post-World War II mortality decline in Cuba. Malaria continued to be a problem even after the anti-mosquito campaigns from 1900 to 1909, partly because of the influx in subsequent decades of malaria sufferers from neighboring countries who arrived in search of work. A 1935 report by the Foreign Policy Association regarded malaria as "the most important public health problem in Cuba" (1935: 99). By the late 1930s, however, Cuba had fewer than 400 malaria deaths per year, and the number dropped below 100 after 1950 (Díaz-Briquets 1983: 73-79). More important to the mortality decline after World War II seems to have been a decline in deaths from influenza, pneumonia, bronchitis, tuberculosis, diarrhea, gastritis, and enteritis (the last three maladies affected mainly infants and children). Díaz-Briquets regards the post-1945 decline of tuberculosis, influenza, and pneumonia deaths as resulting more from the introduction of new drugs than from economic conditions (1981: 407, 409; 1983: 5, 72). He also notes that a campaign against intestinal parasites was launched in 1946 (1983: 82). This depiction of the pace and pattern of mortality decline in Cuba from 1900 to 1960 -- notably, a slow decline before World War II, and a rapid decline afterward -- can be usefully juxtaposed to the evolution of modernization indicators.

3. Modernization and Mortality, 1900 to 1960

Because pre-1959 Cuban governments have a reputation for neglecting the poor, it might be supposed that the gradual modernization of the entire society, more than government provisioning of social services, would account for Cuba’s strong performance on survival-related measures. Such expectations are implicit in the "wealthier is healthier" perspective, which holds that GDP per capita and female education are the main causes of cross-national variation in mortality levels and changes, with income inequality and cultural factors (dominant religion, ethnic fragmentation) playing a significant but smaller role (Pritchett and Summers 1996, Filmer and Pritchett 1999). Education, which we regard as an

outcome of social provisioning rather than as an indicator of modernization, is discussed in Section 4. The present section assesses whether modernization indicators can explain Cuba's low level of infant mortality in 1960, its fast progress at reducing infant mortality from 1900 to 1960, or the tempo of its infant mortality decline from 1900 to 1960.

Higher GDP per capita reduces the risk of early death not only by giving individuals more money to spend on food, shelter, health care, and other basic needs, but also by creating more resources for government-provided social services. In 1960, Cuba ranked sixth in Latin America on GDP per capita -- not as high as on infant mortality (first) or life expectancy (third), but well above the median (Table 7). It should be noted, however, that alternative estimates of GDP per capita in 1960 (Table 8) place Cuba lower relative to other Latin American countries than do the estimates used in Table 7. In Table 7 Cuba ranks sixth of twenty Latin American countries for which data are available; in Table 8 it ranks seventh of nine such countries.

[Insert Tables 7 and 8 About Here]

According to Deininger and Squire (1998) Cuba in 1953 had a Gini index of income inequality of 57.0. Deininger and Squire take this figure from Brundenius (1984), who derived it by projecting the wage distribution obtained from a survey of 1200 employees of "10 leading companies" to occupational groups whose sizes were estimated from census data. The 1200 employees lived mostly in Havana and included no farmers or farm workers (Brundenius 1979: 37-43; Brundenius 1984: 105). Later incorporation of data on agricultural wages reduced the Gini index estimate only from 57 to 55, however (Brundenius 1984: 105-06, 180). Mesa-Lago (1981: 143, 223) had reservations about Brundenius's methodology, but regarded it as ingenious and agreed that income inequality in prerevolutionary Cuba was "extreme." It therefore seems reasonable to accept the Brundenius estimate as valid for comparison to the Gini indices available for eight other Latin American countries from 1953 to 1962. As Table 7 shows, Cuba during the 1950s had one of the highest levels of income inequality in Latin America -- the world region with the highest level of income inequality to begin with. Recent studies have found that income inequality is associated with higher premature mortality, including when controls are inserted for overall affluence and even for absolute poverty (Flegg 1982; Filmer and Pritchett 1999; Daniels, Kennedy, and Kawachi 2000; Hertzman 2001). One causal mechanism may lead from greater income inequality, to higher stress, to excessive stimulation of the endocrine and nervous systems, to worse health (Wilkinson 2001). High income inequality also meant that people particularly vulnerable to premature mortality benefited less from Cuba's fairly high level of overall affluence than would otherwise have been the case.

Cuba in the 1960s had the fifth-highest level of urbanization in Latin America (Table 7). In Europe until 1850 mortality was higher in cities than in rural areas, but thereafter the mortality-reducing

effects of improved health care, better infrastructure, and greater biological resistance began to outweigh the mortality-increasing effects of crowding and exposure to disease (Easterlin 1996: 73-79). If Latin America evolved similarly, greater urbanization in the 1950s should have been associated with lower infant mortality. Most accounts of Cuban health and education services before the revolution highlight a huge imbalance in favor of the cities, particularly Havana. Hence, Cuba's fairly high level of urbanization may help to explain its low level of infant mortality in 1960.

Lower fertility encourages lower infant and child mortality by increasing birth spacing, by lessening the number of higher-order parities, by diminishing the share of births to very young and to very old mothers, by enabling parents to devote more attention to each child, and by reducing the burden on obstetric and pediatric services. Among 20 Latin American countries, Cuba had the third-lowest fertility rate in 1960 (Table 7). Hence, low fertility, along with high urbanization and high GDP per capita, probably contributed to Cuba's low level of infant and child mortality in 1960, partly offsetting the handicap of high income inequality.

On the whole, the "wealthier is healthier" proposition does a fairly good job of explaining Cuba's low level of infant mortality in 1960. It does rather poorly at explaining the country's rapid decline of infant mortality from 1900 to 1960, however. By Latin American standards, Cuba did poorly at economic growth from 1900 to 1960. Astorga and FitzGerald (1998) provide indirect GDP per capita estimates for nine Latin American countries for 1900 and 1960 (Table 8), basing their figures for Cuba on a series developed by Brundenius (1984). According to these estimates, Cuba went from having the third-highest GDP per capita in 1900 to having the third-lowest in 1960. As a result, it ranked ninth among the nine countries at GDP per capita growth during the 61-year period. Cuba from 1900 to 1960 thus came in first in Latin America on mortality decline, but last in GDP per capita growth (among countries for which data are available). Hence, the claim that modernization explains Cuba's rapid infant mortality decline gets off to a rough start. Maddison provides a slightly higher GDP per capita figure for Cuba in 1960, implying somewhat greater economic growth over the six decades, but his estimate exceeds Astorga and FitzGerald's only by a factor of 7.99, compared to 6.89 for the nine countries taken as a group (Table 8). If the discrepancy for Cuba were 6.89 rather than 7.99, Cuba's GDP per capita in 1960, according to the Astorga and FitzGerald measure, would be $452 rather than $390, implying that the economy from 1900 to 1960 would have grown by a factor of 1.66 rather than 1.43. Such a revision would still make Cuba the slowest-growing among the nine Latin American countries in Table 8.

The definition of "urban" changed from census to census (Luzón 1987: 101-103), but from 1899 to 1953 the population share in Cuba's 25 largest cities rose only from 31 to 39 percent, and the proportion in Havana changed little (Table 9). Similar data for other Latin American countries are not available, but the pace of urbanization in Cuba from 1900 to 1960 was probably not among the highest in

the region. Fertility, however, fell rapidly (Díaz-Briquets and Pérez 1982). Among five Latin American countries for which data are available, Cuba was second only to Argentina at decline in the age-standardized birth rate from 1900 to 1950 (Table 10). In assessing the "wealthier is healthier" claim, however, this rapid fertility decline must be set against slow urbanization and very slow economic growth, the latter all the more significant for occurring in the context of high income inequality. On the whole, Cuba from 1900 to 1960 achieved rapid progress at reducing infant mortality despite slow modernization.

[Insert Tables 9 and 10 About Here]

To assess the strength of the relation between modernization and mortality in pre-revolutionary Cuba we can also compare the tempo of progress in each case. The pace of infant mortality decline rose gradually from 1899 to 1930, held steady from 1931 to 1943, and then rose rapidly from 1944 to 1960 (Table 1). Correspondingly, most scholars concur that GDP per capita rose from 1900 to 1925, plunged from 1925 to 1945, and recovered from 1945 to 1957 (Domínguez 2003). According to Domínguez (1978: 74), the index of real income per capita rose from 100 in 1946 to 123 in 1958, down from 134 in 1957. According to Brundenius (1984: 145), real income per capita in 1926 pesos rose from 159 in 1946 to 178 in 1958, down from 205 in 1957. According to the figures for Cuba in Astorga and Fitzgerald (1998: 31), GDP per capita in 1970 $US rose from 374 in 1940 to 380 in 1950 to 390 in 1960. Putting these estimates together, and recognizing that GDP per capita dipped sharply in 1958 in part for conjunctural reasons (the revolution), GDP per capita probably grew a total of 20-30 percent between 1945 and 1957, i.e., on the order of 2 percent per year. This progress was solid, if not spectacular, and was much better than in the first half of the century, when GDP per capita rose little (Brundenius 1984: 5-7, 140, 145). Hence, although GDP per capita growth cannot explain why Cuba led Latin America in mortality decline from 1900 to 1960, faster GDP per capita growth after World War II may have had something to do with faster mortality decline from 1945 to 1960.

Urbanization proceeded at a stately pace throughout the period from 1899 to 1957, with no sign of a slowdown from 1931 to 1943 or of a speedup from 1944 to 1957 (Table 9). Moreover, most of the fertility decline took place before World War II, when infant mortality decline was slow, rather than after World War II, when it was faster (Table 11). Faster fertility decline in the 1920s and 1930s may have encouraged faster infant mortality decline in the 1940s and 1950s, but the mechanisms of such a lagged effect would have to be specified.

[Insert Table 11 About Here]

The "wealthier is healthier" proposition thus fares differently in the three comparisons of mortality and modernization. It fares well on the comparison of levels in 1960, but rather poorly on the

overall amount of progress from 1900 to 1960 and on the tempo of progress from 1900 to 1960. Given this mixed performance, it is well worth exploring whether government provision of basic social services in pre-1959 Cuba may have had a major impact on mortality levels and changes, despite the reputation of most pre-revolutionary governments as failures in this area.

4. Government Provision of Basic Social Services and Mortality Levels and Changes

"Wealthier is healthier" analyses have found that education, especially female education, is the social service with the greatest impact on mortality levels and changes (Pritchett and Summers 1996, Filmer and Pritchett 1999). We find, by contrast, that relatively easy access to fairly high quality health care for an unusually large share of the population (by then-current Latin American standards) was a decisive determinant of infant mortality levels and changes in pre-1959 Cuba.

Literacy and schooling are valuable in themselves, and female education in particular is conducive to lower infant and child mortality (Caldwell 1986, Filmer and Pritchett 1999). Women with more education know more about nutrition, sanitation, and health; tend to be more assertive in demanding food and health care for children; are more inclined to go to modern health facilities; and are more likely to use child care practices that improve health (Caldwell and Caldwell 1993).

Pre-revolutionary Cuban governments were publicly committed to education. The constitutions of 1901 and 1940 mandated free and compulsory education (MacGaffey and Barnett 1962: 157), and the 1920s were "a period of remarkable educational achievement" (Domínguez 1978: 71). Total literacy rose 10 percent, and female literacy 13 percent, between 1919 and 1931 (Table 12). In 1936 the army, led by Fulgencio Batista, established the first of more than 1000 rural misiones educativas (civic-military schools) in which soldiers taught reading, writing, agricultural techniques, nutrition, and hygiene. Day sessions were for children; adults could attend three evenings per week (Pérez 1976: 111-112). These schools were not always adequately equipped (MacGaffey and Barnett 1962: 159), but by the end of the 1930s, an estimated 100,000 persons had enrolled in them (Pérez 1988: 279). In 1944 and 1945 the education ministry built more than 2000 classrooms and expanded school lunch and health programs, but the minister who sponsored these measures became "too popular for his own good" and was replaced in 1945 by José Manuel Alemán, who was notorious for corrupt practices. Among his many disservices to Cuban education, Alemán discontinued the army's rural misiones educativas in 1946 (Ameringer 2000: 32-35).

[Insert Table 12 About Here]

On the downside, however, school administration was overcentralized, reducing local initiative and responsiveness to local needs, and the education ministry was plagued by turnover, policy

discontinuity, patronage appointments, and corruption (Ameringer 2000: 32-36). President Ramón Grau San Martín (1944-1948) built new school facilities and expanded the school lunch and health programs, but located the new facilities where they could be showcased, rather than where they were needed (Ameringer 2000: 72). Education also suffered from urban bias. In 1953, 88 percent of urban residents were literate, compared to only 58 percent of rural residents (Mesa-Lago 2000: 172). Oriente, Cuba's poorest province, enrolled only 20 percent of 5-13 year-olds in primary school, compared to 69 percent in Havana (Nelson 1950: 228). Those rural children who managed to enroll in a primary school often went to class "in a one-room schoolhouse where the teacher has all six grades, is probably inadequately trained, and works without adequate books and supplies" (IBRD 1950, quoted in MacGaffey and Barnett 1962: 161). As late as the 1930s no secondary schools existed outside of the six provincial capitals. Accordingly, "schools in Cuba [failed] entirely to meet the needs of the rural population" (Foreign Policy Association 1935: 130, 137).

Compared to the imperfect educational systems of other contemporary Latin American countries, these advantages and handicaps balanced out to a modest plus. Cuba ranked 5th of 18 Latin American countries on percent literate in 1960, and 6th of 18 at percent rise in literacy from 1900 to 1960 (Table 13). On the other hand, rapid literacy expansion took place during a period of slow infant mortality decline (1899-1931), and vice versa (Tables 1 and 12). Literacy might have had a lagged effect on infant mortality decline, especially because it was measured in the population aged 10 and older, but in 1931-1943, the decade before the post-1945 plunge in infant mortality, female literacy actually fell (Table 12). In cross-national studies, female education is usually found to be highly beneficial for achieving longer life expectancies and lower infant mortality rates (e.g. Caldwell 1986, Filmer and Pritchett 1999). Cuba, however, achieved exceptionally fast mortality decline without exceptionally rapid growth in educational attainment from 1900 to 1960, either for males or for females.

[Insert Table 13 About Here]

Access to safe water reduces infant mortality by lowering the costs of washing and by reducing the risk of contamination from well water and inadequate home storage. Adequate sanitation also lowers the risk of disease. Cuba before 1959 did poorly at expanding access to safe water and adequate sanitation beyond the upper strata of the population in Havana and other large cities. The army in 1933 began to encourage the use of cement floors, sealed wells, and latrines in rural home construction (Batista 1964: 93), but provided little funding for such improvements (Nelson 1950: 202-04). The proportion of Cubans who drew water from a spring, stream, or well (the latter "were everywhere suspect"; Thomas 1971: 433), rather than from a pipe or cistern, fell only from 62 percent in 1899 to 57 percent in 1953. The share of homes with a toilet or an outhouse rose from 47 to 77 percent during this period, but the proportion in rural areas rose only from 32 to 46 percent (Díaz-Briquets 1983: 41-45). Calvó Fonseca et al. (1952: 8)

report that a rural housing census in the early 1950s put the share of such dwellings at 42 percent, but estimate that the true proportion was 20-30 percent. According to a World Bank mission, as late as 1950 some 80 to 90 percent of rural children had intestinal parasites, due mainly to "widespread ignorance of even elementary sanitation and unsanitary water supplies" (IBRD 1951: 441).

Because pre-revolutionary Cuban governments did only moderately well at providing education and quite poorly at delivering safe water and adequate sanitation, health care provision remains a possible explanation for the rapid decline of premature mortality from 1900 to 1959. The island's health care system during these years was divided into contributory, private, and public sectors. The contributory sector served the middle classes, some organized workers, and many of the rich. The private sector, which was small by Latin American standards, served mainly the rich, although most people bought private medical services for some purposes. The purely public sector served mainly the poor, although many who were not poor used its services at one time or another.

Mutualist associations, which emerged in the late 19th century to help immigrants from Galicia, Asturias, and other Spanish regions, dominated the contributory sector in pre-1959 Cuba. These associations offered medical services through their own clinics, doctors, and hospitals, or through contracts with outside health facilities and personnel. They were governed by boards of directors elected by the membership, and many offered educational, recreational, and welfare services as well as medical care. Many eventually widened their memberships to include women (who had been initially excluded) as well as persons from places other than that of the initial group. Helping to minimize monthly fees, many doctors accepted low salaries "because of the prestige that accrued, as well as the advantages of the interesting work in the large, well-equipped hospitals, and the opportunity for professional advancement" (Foreign Policy Association 1935: 120). Mutualist associations served nearly half the people in metropolitan Havana by 1927, and the 350,000 members outside Havana in the 1950s had access to association facilities in the capital as well as in their home provinces (Hernández 1969: 538-541; Danielson 1979: 76-78, 113-115, 120-121; Díaz-Briquets 1983: 51, 103).

Although the mutualist associations provided important health services to a remarkably large share of the population, they "were removed from sanitary and preventive functions, were inadequately linked to hospital and specialty services, made ineffective use of auxiliary personnel and extravagant use of physicians, and were largely disconnected from a geographically defined base" (Danielson 1979: 178). Also, many ethnically-based mutualist associations banned nonwhites altogether, while others segregated patients by race (Danielson 1979: 120). In general, the mutualist associations served Cubans of "moderate income" in Havana and a few other large cities; those from the interior were often too poor to pay the monthly fee (Foreign Policy Association 1935: 120). Hence, racism and the need to make regular, if modest, prepayments, meant that poor people generally received few direct benefits from mutualist health

care services. On the other hand, by serving substantial numbers of Cubans, both poor and non-poor, the mutualist associations freed up resources that the government could devote to health care for the poor (Díaz-Briquets 2003).

New, non-ethnically based mutualist associations known as medical cooperatives began to spring up in the 1920s. They catered to more elite sectors of the population and did more in the way of home visits, being generally poorly endowed with facilities but having a great many physicians under contract. Unlike the mutualist associations, members did not have a say in the governance of the medical cooperatives, and the services the cooperatives provided varied widely in scope and quality. Their expansion was hampered by their need to charge low fees to compete with the mutualist associations, which generally offered more diverse and higher quality services (Hernández 1969: 540-541; Danielson 1979: 113-115). In 1958, according to one estimate, 1,150,000 Cubans, one-fifth of the total population, belonged either to a mutualist health association or to a medical cooperative (Hernández 1969: 555).

In 1938, the communist-led transport workers' union launched a contributory health care plan funded by payroll deductions, similar to funds that existed during the 1940s in Argentina (obras sociales) and Brazil (caixas). The transport workers soon opened their plan to workers outside the sector, and by 1959 it had 25,000 members, some from outside Havana. The health facilities run by the transport workers, unlike those of the mutualist associations, "served a substantial number of nonwhite Cubans and served them without discrimination or segregation." The association employed many physicians who were sympathetic to the left, and by 1959 it had "become a center of considerable experimentation and innovation, with emphasis on preventive medical efforts" (Danielson 1979: 120, 150).

Few hospitals provided services exclusively for out-of-pocket payments; the private sector consisted mainly of doctors who worked part-time for public hospitals, mutualist associations, or medical cooperatives (Hernández 1969: 541, 557). In pre-1959 Cuba, then, the private sector was smaller, and the contributory sector larger, than in most other Latin American countries at similar levels of development. Moreover, although the contributory sector in Cuba included union-based health insurance funds, the mutualist associations dominated. The small role for the private sector and the unions, and big role for mutualist associations, may have made it easier to socialize the medical system in the 1960s (Danielson 1979: 121).

The poor usually received health care from the public system run by the Department of Public Health -- Latin America's first (1909) executive ministry dedicated to health care. The government in the 1950s devoted about 7.5 percent of its budget to "health and welfare," but these funds were depleted by "graft and waste." The number of persons employed to control malaria, for example, continued to soar well after the disease had been brought under control. Public health jobs were often allocated by

patronage, and medical facilities were often built in accordance with "political rather than technical decisions" (MacGaffey and Barnett 1962: 167-68). As was also the case in the private and contributory sectors, public health facilities and health personnel were overconcentrated in Havana. Rural poor people nonetheless could often, although not always, get health care when they needed it. This access, we believe, goes some way toward explaining why pre-1959 Cuba became Latin America's unlikely champion of premature mortality decline.

Cuba in 1957 ranked third among twenty Latin American countries in doctors per capita and fourth in nurses per capita, although nurse's aides and hospital beds were in shorter supply (Table 14). Indeed, as early as the 1930s, foreign observers regarded Cuba as having too many physicians, and a mission sent by the International Labour Organisation recommended limiting the number of new medical graduates each year (Foreign Policy Association 1935: 116, 121). One reason why Cuba had so many doctors may have been that many landowning families responded to the decline in their fortunes in the late 1800s (due to war, economic crisis, technological change, and the influx of US capital) by sending their children to medical school (Danielson 1979: 75). Another reason may have been the free tuition and good medical training facilities at the University of Havana, which enrolled more than 1500 medical students in 1929 (Foreign Policy Association 1935: 116). The mutualist associations, by employing doctors during economic downturns, may also have slowed what might otherwise have been an exodus from the profession (Roemer 1991: 448).

[Insert Table 14 About Here]

Changes over time in the number of doctors per capita may go some way toward explaining Cuba's remarkable success at reducing premature mortality from 1900 to 1959. The more doctors and nurses a country has, all else equal, the greater the supply of medical services, although the poor might well be better off if some of the resources that went into training and paying such highly-skilled professionals were devoted to other types of health workers. As Table 15 shows, population per doctor rose (worsened) from 1899 to 1931, and then declined only slightly from 1931 to 1943. From 1943 to 1953, however, the number of persons per doctor plunged from 1,846 to 940 (Table 15). Part of the reason for this plunge (which indicates a spike in the number of doctors) may have been that growing numbers of retired or semi-retired physicians were reporting that their occupation remained "physician," even as new medical graduates entered the ranks and the life expectancy of retired doctors rose. Such an explanation seems insufficient, however, to explain what would appear to be a doubling of the number of doctors per capita in a single decade. No other indicator we have considered takes such a big jump right when the pace of mortality decline accelerated.

[Insert Table 15 About Here]

Most accounts of health personnel in pre-1959 Cuba stress the overconcentration of doctors and health facilities in the city of Havana. By 1955 the province of Havana contained 62 percent of Cuba's doctors, most of whom worked in the Havana metropolitan area (Hernández 1969: 550). Such overconcentration was bad for the rural poor, but probably benefited the poor in Havana, which in the early 1930s had one poor relief physician for every 2,964 inhabitants, or one for every 1,070 poor persons (the city's indigent population was estimated at 200,000). The city also had 3,000 free hospital beds, one for every 180 inhabitants and one for every 67 indigent persons (Foreign Policy Association 1935: 119). Also, "great numbers of indigents c[a]me to Havana from the interior for hospitalization" (Foreign Policy Association 1935: 119). The problem of the spatial maldistribution of doctors was thus attenuated by Cuba's comparatively small geographical size and well-developed transport system (Hernández 1969: 551).

Moreover, Cubans outside Havana were not entirely deprived of medical care. Larger cities provided free medicine to the poor as early as 1935, and each of Cuba's 124 districts or municipios hired at least one doctor to care for the sick poor. About 200 physicians outside Havana were employed in this fashion, usually on a part-time basis (Foreign Policy Association 1935: 107, 116-18). Interviews by Oscar Lewis and his collaborators in 1969-70 record that even very poor women reported having gone to hospitals and doctors in pre-1959 Cuba, including for prenatal care (Lewis, Lewis, and Rigdon 1977: 131, 135, 147, 245). The government in the early 1950s also launched a "Program for the Development of Rural Dwellers" that included housing and sanitation upgrades, disease control, and mobile medical units (Calvó Fonseca et al. 1952: 18).

Governments in pre-1959 Cuba initiated primary health and mother and child health care initiatives that may also have contributed to mortality decline. "Child hygiene services" operated in Havana and some other large cities in the early 1930s (Foreign Policy Association 1935: 110). In 1934, congress passed a law mandating contributory maternity insurance for working women and for the wives of male workers. The contributions, which came from employers, workers, and the government, were used to build, equip, and staff maternity hospitals and to pay for private medical services including prenatal care, birth attendance, and postpartum care (Hernández 1969: 537). In 1946, the government introduced a campaign against intestinal parasites (Díaz-Briquets 1983: 82). Rural schools created by the army in the mid-1930s were headquartered at centers staffed by a doctor, nurse, dentist, and medical technician. The Batista government in 1952 raised the number of such headquarters to sixty-two and added a new service employing 120 midwives. It also imposed a tax on beer to fund a National Organization of Infant Dispensaries that administered twenty-eight clinics around the country. From 1954 to 1958, these clinics delivered about a million infant and child consultations, inoculations, and medical tests per year (Batista 1961: 96-99, 144-46). Also contributing to mortality decline in the 1940s and 1950s

were the introduction of new insecticides (especially DDT) and pharmaceuticals (sulfa drugs and antibiotics) (Díaz-Briquets 1983: 67-101).

The foregoing description is not meant to imply that the poor had excellent health care in pre-1959 Cuba. The doctors who served the poor in the cities and towns of the interior had low salaries, eschewed home visits, and were "largely untrained in the technique of public health procedure." The government budgeted no funds to permit these doctors to travel, although "many people from the country came to [their] office[s] for quinine and vaccination" (Foreign Policy Association 1935: 107, 116-18). Also, despite the country's small size and good transportation network, many Cubans still lived in remote areas. In a 1943 survey, 392 of 742 rural families lived along roads that vehicles could not use in the wet season (Nelson 1950: 17-18, 258). People in such areas could experience great hardship in seeking medical care (Nelson 1950: 17-18). Health care for the poor before the revolution was not good in absolute terms, but a higher proportion of the poor may well have had access to minimally adequate medical care in Cuba than in most other Latin American countries.

5. Determinants of Health Care Provision and Access

Relations with the United States, labor union strength, and political regime form influenced the provision of health care and disease control in the pre-revolutionary period. Cuba's proximity to the United States was partly responsible for keeping the US government involved in Cuban affairs at a time when infectious disease control could still contribute significantly to mortality decline. Yellow fever, a painful and deadly mosquito-borne disease thought to have been transmitted from Africa to the West Indies on slave ships in the 1600s, was the main focus of US concern. A yellow fever epidemic literally decimated Philadelphia in 1793, causing the deaths of an estimated 5,500 of the city's 55,000 inhabitants, and subsequent outbreaks devastated Memphis, New Orleans, and other large cities (Spielman and D'Antonio 2001: 53-65). Many in the United States regarded Cuba as the source of these epidemics, and there was talk of invading the island solely to prevent the spread of the disease (Spielman and D'Antonio 2001: 122). A mild form of yellow fever afflicted many infants in Cuba, conferring subsequent immunity (Danielson 1979: 97). Foreigners, however, were vulnerable. During their occupation from 1898 to 1902 an estimated 80 percent of US army troops came down with the disease (Spielman and D'Antonio 2001: 122). More Spanish and US soldiers died of disease, especially yellow fever, than of battle injuries during the Spanish-American War from 1895 to 1898 (Danielson 1979: 78-79; Thomas 1971: 405, 414).

The dangers of yellow fever and malaria encouraged the US government to improve mosquito control, health education, quinine provision, trash collection, patient isolation, and other sanitary reforms when it occupied the island from 1898 to 1902 and from 1906 to 1909 (Lockmiller 1938: 112-117; Danielson 1979: 89-92; Díaz-Briquets 1983: 28-36; Centro de Estudios Demográficos 1976: 15). During

the first occupation William Gorgas, the administrator of Havana's Sanitation Department, turned Havana into "what may have been the cleanest major city on earth." He also took action based on the hypothesis, first proposed by Cuban physician Carlos Finlay, that mosquitoes spread yellow fever. Gorgas ordered soldiers to drain ditches, oil ponds, fumigate houses, isolate yellow fever sufferers in screened rooms, and "swat adult mosquitoes, one by one" (Spielman and D'Antonio 2001: 122). In Havana, yellow fever deaths fell from an annual average of 706 (for 1868-1898) to 310 in 1900 and to 0 in 1902 (Danielson 1979: 90). Malaria deaths, meanwhile, fell from 59 per 100,000 in 1901 to 8 per 100,000 in 1907 (Díaz-Briquets 1981: 403).

The goal of attracting tourists motivated the Cuban government to improve Havana's water and sewer systems; high sugar revenues from 1907 to 1919 provided the means (Schwartz 1997: 19). Even after lifting the military occupation of Cuba in 1909, moreover, the US government insisted that the Cuban government pay close attention to sanitary conditions and disease outbreaks. The Platt Amendment to the Cuban constitution of 1901, which was in effect until 1934, authorized the United States to invade and re-occupy the island if the government neglected disease control (Díaz-Briquets 1983: 35-37). These advances in sanitation and mosquito control in the first decade of the 20th century did not produce an immediate decline in premature mortality, which fell more slowly in Cuba at the beginning of the twentieth century than after World War II (Tables 1 and 2), but the rapid decline in later years would have been much harder without them.

Cuba's smallish land area, which gave many rural people access to health care in Havana, was conducive to the delivery of the basic health services to the poor. The concentration of much of the rural population around sugar mills also facilitated the provision of health services. About 42 percent of Cuba's labor force worked in agriculture in 1953, and more than half of agricultural workers earned a living from sugar (MacGaffey and Barnett 1962: 141). Big sugar mills were legally required to have a doctor on hand to treat job-related injuries and to supervise sanitary conditions. Moreover, "many plantations [went] much further than the legal requirements, supplying free medical care, nursing service, medicines and sometimes hospitalization for their employees" (Foreign Policy Association 1935: 118-19). By 1941 the United Fruit Company, Cuban-American Sugar, and Cuba Cane were each deducting 1-2% of their workers' salaries for health care. The United Fruit company built two hospitals and several nursing stations on its holdings; it also took mosquito control measures and provided quinine to people with malaria (Varios Autores 1976: 310-313). A United Fruit Company plantation in Oriente is reported to have used malaria control methods that helped to "reduce the devastation of this disease to the vanishing point" (Foreign Policy Association 1935: 99). The health services delivered on sugar plantations were not beyond reproach. Around 1920, the hospital of the Santa Lucia sugar mill in Oriente had poor hygiene, according to a patient (Núñez Machín 1981: 30). On balance, however, the sugar industry probably facilitated the rapid decline of premature mortality in pre-1959 Cuba.

Labor unions in Cuba organized about 14 percent of the labor force in 1946 and about 60 percent in 1960. These figures were very high for Latin America. Among the 18-20 Latin American countries for which data are available, Cuba in 1946 trailed only Chile (15 percent) on labor union members as a share of the labor force, and in 1960 it trailed only Venezuela (64 percent) (Table 16). According to James O'Connor (1964: 148), pre-revolutionary Cuba, particularly after the mid-1930s, had one of the strongest labor movements in Latin America and possibly in the world. The implications of labor union strength for progress at reducing infant mortality are not clear-cut, however. Unlike in industrialized countries, labor union strength in middle-income developing countries seems often to slow mortality decline, in part by biasing social policies toward the urban formal sector at the expense of the very poor (McGuire 1999). Not so in Cuba, which during the pre-revolutionary era combined one of the region's strongest labor union movements with the very fastest rate of mortality decline in Latin America. Moreover, mortality fell fastest during the 1940s and 1950s, when the labor movement was strongest. Besides organizing a large share of the labor force, Cuban labor had a long history of militancy. Workers launched major strikes in 1917-1920 and 1923-1925, and strikes in Havana helped to bring down the Machado dictatorship in 1933 (Alba 1968: 289-291; Domínguez 1978: 50-51).

Leaders had two options for dealing with labor: repression or concession. Machado used harsh repression from 1925 to 1933 but was unable to subdue the workers. Grau San Martín courted labor during his first presidency in 1933-34, but the massive strike activity that followed his overthrow ushered in another year of harsh repression. By 1936, however, Batista, now the power behind the scenes, was seeking to legitimate his rule, and was concerned that the power and militancy of the communist-led labor movement could threaten political stability (Domínguez 1978: 79, 87, 96). At the same time, communist parties throughout Latin America, Cuba included, were turning to electoral politics in accordance with Stalin's united front strategy. Because most of his political opposition came from the left, Batista could move toward the center, where most of the votes were, by adopting more populist, pro-labor policies (Domínguez 2003). Partly in response to these incentives, Batista made an alliance with the communist-led unions and, in the late 1930s and early 1940s, legalized the Communist party and passed several pro-labor laws. The Auténtico governments of 1944-1952 continued to support worker-friendly legislation, and after Batista returned to power in a 1952 coup he attempted to buy off workers with employment and public works programs, even as he harassed unions and cracked down on strikes.

The Cuban labor movement had both significant electoral clout and the capacity to damage the economy through strikes and militancy. Because the labor movement repeatedly showed its ability to withstand repression, and because repression is a costly way to rule, post-1933 governments yielded, at least in part, to worker demands. So did employers. Cuban workers in 1957 are reported to have enjoyed relatively high wages: $6.00 in then-current US dollars for an 8-hour day, compared to US $5.80 in Norway and US $4.29 in France. Some skilled workers could make US $10.00-$11.00 a day, and even

agricultural and unskilled sugar workers received US $3.00-$4.00 a day (O'Connor 1964: 144; Batista (1961: 86) provides similar comparative wage figures for 1958). According to the International Labour Office (ILO 1961: 399-400), employee compensation in 1958 comprised 66.6 percent of national income in Cuba, the second-highest share (after Panama at 68.4 percent) among the nine Latin American countries for which data are available. High wages gave workers a better standard of living and allowed some to join the mutualist associations.

The Cuban governments of 1934-1959 depended heavily on patronage and tended especially to exchange favors with labor bosses. Cuba would seem therefore to be a strong candidate to fall into a pattern typical of Argentina, Brazil, and Chile, where unions, allied with better-off groups, induced governments to enact urban-biased and formal sector-biased policies that contribute to the neglect or further impoverishment of the rural and urban poor (McGuire 1999). One difference between Cuba and other Latin American countries is, however, that sugar workers in Cuba comprised a significant share of both unionists and the rural poor. In 1955, the Cuban Workers' Confederation (CTC) claimed 1,234,900 workers, among them 500,000 sugar workers and 98,000 tobacco workers (Schroeder 1982: 210-211). In other Latin American countries during the 1930s and 1940s, union members were more exclusively urban. Hence, the Cuban labor movement represented less of a labor aristocracy than did, say, the labor movements of contemporary Argentina, Brazil, Chile, or Venezuela. Cuba during this era had high income inequality, and many of the rural poor were not union members, but the significant share of poorer agricultural workers who did belong to unions in Cuba may well have enabled labor strength to contribute to, rather than detract from, the decline of premature mortality. There is little evidence that unions pressured specifically for better health care facilities, but their penetration of rural areas and success at securing wage hikes meant that union members could use health facilities that existed primarily for other reasons.

Political democracy from 1940 to 1952 may also have facilitated rapid mortality decline. Competition during this era was mainly between left parties and coalitions, so candidates often courted votes by promising and enacting social programs. It was often necessary to appeal to a "political organization" to gain access to a clinic or hospital bed, and medical "services were channeled to the rural population through leaders of the party in power. Those using the health services and facilities were strongly reminded of the source of the benefits, and many were required to vote accordingly" (MacGaffey and Barnett 1962: 168). Patronage is a suboptimal way to allocate access to health care, but it may have benefited the Cuban poor more than the obvious alternative mechanism, ability to pay. In any case, mortality fell especially fast during this democratic period (Díaz-Briquets 1983: 21).

6. Conclusions

Revolutionary Cuba's acclaimed success at reducing mortality, although impressive, should not be overstated. Pre-revolutionary Cuba's unheralded success at reducing mortality should be more fully appreciated and studied, especially because it occurred despite slow economic growth and high income inequality. The case of Cuba from 1900 to 1960, although not entirely inconsistent with the "wealthier is healthier" proposition, shows that rapid declines in premature mortality are possible despite unfavorable socioeconomic contexts. Other Latin American examples of this phenomenon include Cuba itself during the economic crisis of the 1990s (Barraclough 2000; Chomsky 2000); Chile under Pinochet from 1973 to 1983 (McGuire 2001), and El Salvador and Nicaragua in the war-torn 1980s (Ugalde et al. 2000; Garfield 1989). These cases, together with a cross-national quantitative study (McGuire 2002), suggest that the "wealthier is healthier" claim may overstate the importance of modernization in contributing to rapid declines and low levels of premature mortality, and understate the case for public provisioning of basic health services to the poor. We have argued that in Cuba from 1900 to 1959, modernization played a smaller role, and the public provisioning of basic health services a larger one, than the "wealthier is healthier" claim implies.

The factors that contributed to rapid mortality decline in pre-revolutionary Cuba included a bountiful supply of doctors and nurses, fairly good health services for the urban poor, and access to at least some health services for the rural poor. Among the contextual factors that made such services more accessible were United States pressure for and involvement in disease control; the island's small geographical size; the semi-industrial character and spatial concentration of sugar production; a rural class structure in which a large fraction of the rural poor were wage workers; a powerful labor movement with an unusually rural constituency; and the presence from 1940 to 1952 of electoral competition, which encouraged political brokers to trade health services for votes. By highlighting these factors we hope to provoke research on their evolution in other cases, and to provide inspiration for further inquiry into the characteristics and causes of mortality decline in Cuba itself.

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Appendix 1

Calculation of the Mean Annual Percent Change in Infant Mortality and Life Expectancy: Examples

Infant Mortality (Table 1)

(1) In column 1, the total percent decline in infant mortality from 1899 to 1907 is (265-213)/(265), or 19.6 percent.

(2) Our (crude) measure of the annual percent decline is therefore 19.6 percent ÷ 8 years, or 2.45 percent (using a compound interest function doesn't make much difference because our intervals are fairly short).

(3) Each cell in Column 1 for the years 1899-1906 inclusive thus acquires a value of 2.45 percent.

(4) This procedure is repeated for the remaining pairs of successive observations in Column 1 (e.g., 1907-1919, 1919-1931, etc.), and then for each pair of successive observations in Columns 2-7 consecutively. We thus make use of Díaz-Briquets's two series for Havana (Columns 6 and 7) but exclude the vital registration series for Cuba as a whole (Column 8).

(5) The result of this exercise is a grid resembling Table 1, with the years 1899 to 1960 down the side and seven infant mortality series across the top. Each cell in the grid contains an annual percent decline value (in other words, each cell in the grid is filled, unlike the grid in the existing Table 1).

(6) We then take the mean of the percent decline values in each row (year) and record it in the cell at the end of the row (Column 9).

Life Expectancy (Table 2)

(1) In Column 1, the total percent rise in life expectancy at birth from 1900 to 1905 is (34.20-33.16)/(85.0-33.16), or 2.04 percent (the percent rise in life expectancy calculation stipulates a "target" of 85 years).

(2) The annual percent rise for the period is thus 2.04 percent ÷ five years, or 0.41 percent.

(3) Each cell in Column 1 from 1900 to 1904 inclusive thus acquires a value of 0.41 percent.

(4) This procedure is repeated for the remaining pairs of successive observations in Column 1, and then for all pairs of successive observations in Columns 2-7.

(5) The value in each cell in Column 8 is the mean of the resulting annual percent decline figures in each row (year).

Table 1: Infant Mortality Estimates for Cuba and Havana, 1899-1960

Source	Losada 1999	Centro de Est. Dem. 1976	Catasus Cervera 1977	González 1996	Collver 1965	Díaz Briq. 1983, p. 54	Díaz Briq. 1983, p. 174-79	Vital registr.	Avg. annual % decline
Origin	Census	Census	Census	Census	Census	Cens, VR	Cens, VR	VR	
Scope	Cuba	Cuba	Cuba	Cuba	Cuba	Havana	Havana	Cuba	
Note	1	2	3	4	5	6	7	8	9
1899	265	225							0.6%
1900			224	195	136				0.6%
1901				195	136	232	207		1.3%
1902				195	136			141	1.3%
1903				195	136			109	1.3%
1904				195	136			124	1.3%
1905			215	192	146			122	1.3%
1906				192	146			154	1.6%
1907	213	213		192	146	189	170	163	1.6%
1908				192	146			127	1.4%
1909				192	146			166	1.4%
1910			207	187	140			140	1.4%
1911				187	140			168	1.4%
1912				187	140			116	1.4%
1913				187	140			152	1.4%
1914				187	140			118	1.4%
1915			199	180	136				1.4%
1916				180	136				1.3%
1917				180	136				1.3%
1918				180	136				1.3%
1919	197	192		180	136	120	111		1.3%
1920			192	172	135				1.4%
1921				172	135				2.0%
1922				172	135				2.0%
1923				172	135				2.0%
1924				172	135				2.0%
1925			184	161	110				2.0%
1926				161	110				2.5%
1927				161	110				2.5%
1928				161	110			148	2.5%
1929				161	110			169	2.5%
1930			167	148	76			46	2.5%
1931	150	168		148	76	83	78	84	1.7%
1932				148	76			111	1.5%
1933				148	76				1.5%
1934				148	76				1.5%
1935			151	129	78				1.5%
1936				129	78				2.2%
1937				129	78				2.2%
1938				129	78				2.2%
1939				129	78				2.2%
1940			139	109	61				2.2%
1941				109	61				2.1%
1942				109	61				2.1%
1943	91	131		109	61	77	73		2.1%
1944				109	61				3.3%
1945			124	91	52				3.3%
1946				91	52				4.0%
1947				91	52				4.0%
1948				91	52			59	4.0%
1949				91	52			41	4.0%
1950			97	70					4.0%
1951				70					3.6%
1952				70					3.6%
1953	53			70		50	48	35	3.6%
1954				70					3.6%
1955			79	58					3.6%
1956				58					4.3%
1957				58					4.3%
1958				58				33	4.3%
1959				58				35	4.3%
1960			62					36	4.3%

Notes to Table 1
Infant Mortality Estimates for Cuba and Havana, 1899-1960

1. Losada 1999: 178. Original data for 1899 from Cuba. Secretaría de Estado. Boletín Oficial de la Secretaría de Estado (an issue from between 1907 and 1935); 1907-1931 from Centro de Estudios Demográficos (1976); 1943 and 1953 from López Fernández (1972).

2. Centro de Estudios Demográficos (1976): 60. Original data for 1899-1943 from Elio Velásquez and Lázaro Toirac, Cuba: Tablas de mortalidad estimadas por sexo, para los años calendarios terminados en cero y cinco durante el período 1900-1950, Estudios Demográficos, Serie 1, No. 3. July. (La Habana: Centro de Estudios Demográficos, Instiuto de Economía, Universidad de La Habana, 1975). The table in Centro de Estudios Demográficos (1976): 60 includes figures for 1953 and for 1958-1970, but they are derived from uncorrected vital registration statistics and are omitted from the present table.

3. Catasus Cervera and Hernández Castellón 1977: 283. Hollerbach and Díaz-Briquets (1983: 5) regard these figures as overestimates. Original data from Elio Velásquez and Lázaro Toirac, Cuba: Tablas de mortalidad estimadas por sexo, para los años calendarios terminados en cero y cinco durante el período 1900-1950, Estudios Demográficos, Serie 1, No. 3. July. (La Habana: Centro de Estudios Demográficos, Instiuto de Economía, Universidad de La Habana, 1975); and Alfonso Farnos, "Cuba: Tablas de Mortalidad Estimadas por Sexo, 1955-1970." Unpublished paper. La Habana: Centro de Estudios Demográficos, Instituto de Economía, Universidad de la Habana.

4. González Quiñones and Ramos Piñol (1996): 34. Based on census data before 1955 and, apparently, on CELADE and JUCEPLAN data for 1955-59. Incorporates new data on migration, corrects for census underregistration of under-5 children, and uses the method of inverse projection.

5. Collver 1965: 108. Hollerbach and Diaz-Briquets (1983: 5) regard these figures as underestimates.

6. Díaz-Briquets 1983: 54. "Annual death rates per 1,000 population, by sex and age, City of Havana." Original source: "Cuban censuses and vital statistics." Number in column is mean of separate figures for males and females.

7. Díaz-Briquets 1983: 174-179. Average of male and female qx's at age 0, multiplied by 1000, from life tables for municipality of Havana. Source given as "Cuban censuses and vital statistics."

8. Vital registration statistics for 1902-13 from Cuba 1915: 36-37; for 1928-32 from Foreign Policy Association 1935: 103; for 1948-49 from Cuba. MH/DGE 1958: 93; for 1953-1963 from Cuba. JUCEPLAN/DCE 1974: 28.

9. The method for calculating the average annual percent decline in infant mortality is described in Section 2 and illustrated in Appendix 1.

Table 2: Life Expectancy Estimates for Cuba, 1899-1960

Source	Farnos Morejón 1977	Centro de Estudios Demográf 1976	Díaz-Briquets 1983	Astorga and Fitzgerald 1998	Mezquita 1970	Debasa & González Quiñones 1971	CEPAL/ CELADE 2002	Avg. annual % rise
Note	1	2	3	4	5	6	7	8
1899								
1900	33.2	33.2		32				0.5%
1901								0.5%
1902								0.5%
1903								0.5%
1904								0.5%
1905	34.2	34.2	36.4					0.4%
1906								0.4%
1907								0.4%
1908								0.4%
1909								0.4%
1910	35.3			36				0.4%
1911								0.4%
1912								0.4%
1913								0.4%
1914								0.4%
1915	36.3		37.2					0.4%
1916								0.5%
1917								0.5%
1918								0.5%
1919					39.2	44.0		0.8%
1920	37.4	37.4		39	39.2	44.0		0.8%
1921					39.2	44.0		0.8%
1922					39.2	44.0		0.8%
1923					39.2	44.0		0.8%
1924					39.2	44.0		0.8%
1925	38.5		39.2		39.2	44.0		0.8%
1926					39.2	44.0		1.1%
1927					39.2	44.0		1.1%
1928					39.2	44.0		1.1%
1929					39.2	44.0		1.1%
1930	41.5	41.5		42	39.2	44.0		1.1%
1931					46.4	50.6		1.3%
1932					46.4	50.6		1.3%
1933					46.4	50.6		1.3%
1934					46.4	50.6		1.3%
1935	44.6				46.4	50.6		1.3%
1936					46.4	50.6		1.3%
1937			46.4		46.4	50.6		1.3%
1938					46.4	50.6		1.4%
1939					46.4	50.6		1.4%
1940	47.5			45	46.4	50.6		1.4%
1941					46.4	50.6		1.8%
1942					46.4	50.6		1.8%
1943					57.3	53.5		2.0%
1944					57.3	53.5		2.0%
1945	51.0	51.0			57.3	53.5		2.0%
1946					57.3	53.5		2.6%
1947					57.3	53.5		2.6%
1948					57.3	53.5		2.6%
1949					57.3	53.5		2.6%
1950	55.8			56	57.3	53.5	59.5	2.6%
1951					57.3	53.5	59.5	2.7%
1952					57.3	58.1	59.5	2.7%
1953		58.8	58.8		57.3	58.1	59.5	2.7%
1954						58.1	59.5	3.1%
1955	60.7						62.4	2.8%
1956							62.4	2.6%
1957							62.4	2.6%
1958							62.4	2.6%
1959							62.4	2.6%
1960	64.0			64			65.4	2.6%

Notes to Table 2
Life Expectancy Estimates for Cuba, 1899-1960

1. Farnos Morejón 1977: 359. Original data from 1900 to 1950 apparently from Elio Velásquez and Lázaro Toirac, Cuba: Tablas de mortalidad estimadas por sexo, para los años calendarios terminados en cero y cinco durante el período 1900-1950, Estudios Demográficos, Serie 1, No. 3. July. (La Habana: Centro de Estudios Demográficos, Instiuto de Economía, Universidad de La Habana, 1975). Original data for 1955 and 1960 from Alfonso Farnos, "Cuba: Tablas de Mortalidad Estimadas por Sexo, 1955-1970." Unpublished paper. La Habana: Centro de Estudios Demográficos, Instituto de Economía, Universidad de la Habana.

2. Centro de Estudios Demográficos 1976: 55. Original data: 1900-45 from Elio Velásquez and Lázaro Toirac, Cuba: Tablas de mortalidad estimadas por sexo, para los años calendarios terminados en cero y cinco durante el período 1900-1950, Estudios Demográficos, Serie 1, No. 3. July. (La Habana: Centro de Estudios Demográficos, Instiuto de Economía, Universidad de La Habana, 1975); 1953 from González Quiñones and Debasa 1970.

3. Díaz-Briquets 1983:19. Original data: 1905 and 1915 calculated by Diaz-Briquets; 1925 and 1937 from Mezquita 1970; 1953 from González Quiñones and Debasa 1970.

4. Astorga and Fitzgerald 1998: 32. Original data for 1900-1940 from H. Pérez Brignoli, "América Latina en la Transición Demográfica," in Instituto Nacional de Estadística, Geografía e Informática [Mexico, D. F.] (1993), La transición demográfica en América Latina y el Caribe, V. 1. Pérez Brignoli uses the method of inverse projection (Astorga and Fitzgerald 1998: 28). Original data for 1950-1960 from CELADE, Boletín Demográfico, various years; "1950 projected from 1955 and 1960" (Astorga and Fitzgerald 1998: 28).

5. Mezquita 1970: 33-35. Original data: Life tables based on census results. The estimates are for five-year periods; the last year of each period overlaps with the first year of the next period.1931 and 1943 are years in which the estimates overlap; the value recorded for each year is that of the later five-year estimate. The values are the means of separate figures for males and females; the sex ratio of population is not taken into account.

6. Debasa and González Quiñones 1971: 27-36. Original data: Life tables based on census data analyzed with principal components. The estimates are for periods encompassing up to 12 years; the last year of each period overlaps with the first year of the next period.1931, 1943, and 1952 are years in which the estimates overlap; the value recorded for each year is that of the later estimate. The values are the means of separate figures for males and females; the sex ratio of population is not taken into account.

7. CEPAL/CELADE 2002: 22. The estimates are for five-year periods; the last year of each period overlaps with the first year of the next period. The value recorded for 1955, an overlap year, is that for 1955-1960.

8. The method for calculating the average annual percent rise in life expectancy is described in Section 2 and illustrated in Appendix 1.

Table 3
Infant Mortality Estimates, Cuba, 1957-1963

Source	JUCE-PLAN 1974	UNDY-HS 2000	SALA 1970 reported	SALA 1970 correctd	Landstreet 1976 correctd	Income Survey 1974	Demogr Survey 1979	Hill et al. 1999	Catasus Cervera 1977	González Quiñones 1996	CEPAL/ CELADE 2002
Origin	VR	VR	VR	VR (corr)	VR (corr)	Survey	Survey	Surv/VR	Census	Census	Unknown
Note	1	2	3	4	5	6	7	8	9	10	11
1957		36								58	70
1958	33	*70	33	36	36					58	70
1959	35	35			37	43				58	70
1960	36	37	35	40	40			39	62		59
1961	38	39	37	41	41						59
1962	42	42	40	44	44	38					59
1963	37	38	38	41	42		38				59

Notes to Table 3
Infant Mortality Estimates, Cuba, 1957-1963

1. Cuba. JUCEPLAN/DCE 1974: 28.

2. United Nations 2000. Identical figures for 1960, 1961, 1962, and 1963 appeared in de la Osa (2002 and 2003), writing in Granma, and were therefore apparently accepted by the Cuban government. From vital registration statistics, except for the estimate for 1958 (marked with *), which was prepared by the United Nations Populations Division. A note in the source reads "Prior to 1957, excluding live-born infants dying within 24 hours of birth. Beginning 1957, data are estimates based on analysis of 1943 and 1953 population census results and application of an assumed rate of growth."

3. Roberts and Hamour 1970: 68. Unadjusted vital statistics. Infants dying within 24 hours of birth are counted as infant deaths.

4. Roberts and Hamour 1970: 68. Vital statistics adjusted upward to take account of presumed omissions. Infants dying within 24 hours of birth are counted as infant deaths.

5. Landstreet 1976: 90. Data have been adjusted upward to take account of underregistration. Original data from Cuba. Junta Central de Planificación (JUCEPLAN), "Resumen de Estadísticas de Población," No. 3. La Habana: Dirección Nacional de Estadística, 1968.

6. United Nations 1992: 105. Indirect estimates, West Model. Original estimates from Encuesta Nacional de Ingresos y Egresos de la Población, 1974, as reported in "Cuba: La mortalidad infantil y sus diferencias sociales y económicas," La Habana: Comité Estatal de Estadísticas; and Santiago, Chile, Centro Latinoamericano de Demografía, 1988, p. 101, Table II.4, unpublished.

7. United Nations 1992: 105. Indirect estimates, West Model. Original estimates from Encuesta Demográfica Nacional de1979, V. 1, Metodología y tablas seleccionadas (Havana: Comité Estatal de Estadísticas, 1981), p. 25, Table 1, and "Cuba: La mortalidad infantil y sus diferencias sociales y económicas," La Habana: Comité Estatal de Estadísticas; and Santiago, Chile, Centro Latinoamericano de Demografía, 1988, p. 101, Table II.4, unpublished.

8. Hill et al. 1999: 70. The estimate is based on a knotted regression line fitted to (a) unadjusted vital registration statistics; (b) indirect estimates based on the 1974 Encuesta Nacional de Ingresos y Egresos de la Población; and (c) indirect estimates based on the 1979 Encuesta Demográfica Nacional.

9. Catasus Cervera and Hernández Castellón 1977: 283. Hollerbach and Díaz-Briquets (1983: 5) regard these figures as overestimates. Original data from Elio Velásquez and Lázaro Toirao, Cuba: Tablas de mortalidad estimadas por sexo, para los años calendarios terminados en cero y cinco durante el período 1900-1950, Estudios Demográficos, Serie 1, No. 3. July. (La Habana: Centro de Estudios Demográficos, Instiuto de Economía, Universidad de La Habana, 1975); and Alfonso Farnos, "Cuba: Tablas de Mortalidad Estimadas por Sexo, 1955-1970." Unpublished paper. La Habana: Centro de Estudios Demográficos, Instituto de Economía, Universidad de la Habana.

10. González Quiñones and Ramos Piñol (1996): 34. Based on census data before 1955 and, apparently, on CELADE and JUCEPLAN data for 1955-59. Incorporates new data on migration, corrects for census underregistration of under-5 children, and uses the method of inverse projection.

11. CEPAL/CELADE 2002: 24. The source provides no information about the original data or the methodology of the estimates.

Table 4
Infant Mortality Estimates for Cuba, 1959-2002

Source	Hill et al. 1999	de la Osa (Granma) 2003	Anuario Estadístico 1974	Landstreet 1976	Income Survey 1974	Demogr Survey 1979	Census 1981	Life Tables late 1980s	Catasus Cervera 1977	CEPAL/ CELADE 2002
Origin	Survey, Cens., VR	Vital Registrat.	Vital Registrat.	Vital Reg., corrected	Survey	Survey	Census	Unknown	Census	Unknown
Note	1	2	3	4	5	6	7	8	9	10
1959			34.7	37.3	43					69.9
1960	39	37.3	35.9	39.8					62.3	59.4
1961		39.0	37.6	41.3						59.4
1962		41.7	41.5	43.6	38					59.4
1963		38.1	37.1	41.7		38				59.4
1964		37.8	37.4	40.3						59.4
1965	37	37.9	37.8	40.3	35				48.7	49.7
1966		37.3	37.2	39.5		37	34			49.7
1967		36.4	36.4	40.5	36					49.7
1968		38.3	38.2	41.3						49.7
1969		46.7	46.7	48.2		35	33	41		49.7
1970	35	38.7	38.7	38.4	30			41	37.9	38.5
1971		36.1	37.4	34.0	32			41		38.5
1972		28.7	27.4	27.5		31	30			38.5
1973		29.6	28.9		28					38.5
1974		29.3	27.9			30	27			38.5
1975	27	27.5								22.5
1976		23.3				33				22.5
1977		24.9					24			22.5
1978		22.4				38				22.5
1979		19.4					21			22.5
1980	19	19.6					18	18		17.0
1981		18.5						18		17.0
1982		17.3						18		17.0
1983		16.8								17.0
1984		15.0								17.0
1985	15	16.5						15		12.9
1986		13.6						15		12.9
1987		13.3								12.9
1988		11.9								12.9
1989		11.1								12.9
1990	11	10.7								10.0
1991		10.7								10.0
1992		10.2								10.0
1993		9.4								10.0
1994		9.9								10.0
1995	9	9.4								7.5
1996		7.9								7.5
1997		7.2								7.5
1998		7.1								7.5
1999		6.4								7.5
2000		7.2								7.5
2001		6.2								
2002		6.5								

Notes to Table 4:
Infant Mortality Estimates for Cuba, 1959-2002

1. Hill et al. 1999: 70. The estimate is based on a knotted regression line fitted to (a) unadjusted vital registration statistics; (b) indirect estimates based on the 1974 Encuesta Nacional de Ingresos y Egresos de la Población; and (c) indirect estimates based on the 1979 Encuesta Demográfica Nacional.

2. de la Osa 2003. Series identical to those in United Nations 1992, United Nations 2000, and Cuba. ONE/UNFPA (2001).

3. Cuba. JUCEPLAN/DCE 1974: 28.

4. Landstreet 1976: 90. Data have been adjusted upward to take account of underregistration. Original data from Cuba. Junta Central de Planificación (JUCEPLAN), "Resumen de Estadísticas de Población," No. 3. La Habana: Dirección Nacional de Estadísticas, 1968.

5. United Nations 1992: 105. Indirect estimates, West Model. Original estimates from Encuesta Nacional de Ingresos y Egresos de la Población, 1974, as reported in "Cuba: La mortalidad infantil y sus diferencias sociales y económicas," La Habana: Comité Estatal de Estadísticas; and Santiago, Chile, Centro Latinoamericano de Demografía, 1988, p. 101, Table II.4, unpublished.

6. United Nations 1992: 105. Indirect estimates, West Model. Original estimates from Encuesta Demográfica Nacional de1979, V. 1, Metodología y tablas seleccionadas, La Habana: Comité Estatal de Estadísticas, 1981, p. 25, Table 1, and "Cuba: La mortalidad infantil y sus diferencias sociales y económicas," La Habana: Comité Estatal de Estadísticas and Santiago, Chile, Centro Latinoamericano de Demografía, 1988, p. 101, Table II.4, unpublished.

7. United Nations 1992: 105. Indirect estimates, West Model. Original estimates from Censo de Población y Viviendas, 1981, República de Cuba. V. 16 (Havana: Comité Estatal de Estadísticas, Oficina Nacional del Censo, 1984), pp. 99 and 105, Tables 25 and 26.

8. United Nations 1992: 105. According to "data provided to the UN Statistical Office." Not clear what sort(s) of data went in to the construction of these life tables.

9. Catasus Cervera and Hernández Castellón 1977: 283. Original data from Alfonso Farnos, "Cuba: Tablas de Mortalidad Estimadas por Sexo, 1955-1970." Unpublished paper. La Habana: Centro de Estudios Demográficos, Instituto de Economía, Universidad de la Habana.

10. CEPAL/CELADE 2002: 24. The source provides no information about the original data or the methodology of the estimates.

Table 5

Infant Mortality and Life Expectancy, 1960 and 1995, 20 Latin American Countries

Country	Infant mortality	Infant mortality	Infant mortality, percent decline	Country	Life expectancy	Life expectancy	Life expectancy percent increase
	1960	1995	1960-1995		1960	1995	1960-1995
Chile	118	11	91%	Chile	57.3	74.9	63%
Costa Rica	87	12	86%	Costa Rica	61.9	76.2	62%
El Salvador	129	25	81%	Honduras	46.6	68.7	57%
Honduras	137	29	79%	**Cuba**	64.2	75.8	56%
Cuba	**39**	**9**	**77%**	Domin. Rep.	52.2	70.4	56%
Ecuador	107	27	75%	Peru	48.0	67.8	54%
Panama	58	16	72%	Nicaragua	47.3	67.3	53%
Peru	142	40	72%	Panama	60.9	73.6	53%
Nicaragua	130	38	71%	El Salvador	50.8	68.5	52%
Colombia	79	24	70%	Mexico	57.3	71.5	51%
Mexico	94	32	66%	Venezuela	59.8	72.4	50%
Guatemala	136	48	65%	Ecuador	53.4	68.1	46%
Brazil	115	41	64%	Colombia	56.8	69.8	46%
Venezuela	56	21	63%	Guatemala	45.9	63.6	45%
Argentina	60	23	62%	Bolivia	42.8	60.6	42%
Paraguay	67	26	61%	Brazil	54.9	66.5	39%
Uruguay	48	20	58%	Argentina	65.2	72.7	38%
Domin. Rep.	102	47	54%	Uruguay	68.0	73.4	32%
Bolivia	152	77	49%	Haiti	42.4	53.6	26%
Haiti	169	95	44%	Paraguay	63.9	69.2	25%

Notes and Sources

Infant mortality: Infant (0-1) deaths per 1000 live births. Percent decline is toward a stipulated minimum of 0. Source: Hill et al. 1999, from census, survey, and/or vital registration statistics.

Life expectancy: in years, at birth. Source: World Bank 2002, from unspecified original data. Percent increase is toward a stipulated maximum of 85 years.

Table 6

Infant Mortality and Life Expectancy, 1900 and 1960, 8 or 12 Latin American Countries

	Infant mortality	Infant mortality	Infant mortality percent decline		Life expectancy	Life expectancy	Life expectancy percent increase
	1900-04	1960	1900-1960		1900	1960	1900-1960
Note	1	2	3		4	5	6
Cuba	136	39	71%	**Cuba**	32	64	60%
Venezuela	169	56	67%	Venezuela	25	60	58%
Argentina	146	60	59%	Costa Rica	32	62	57%
Costa Rica	208	87	58%	Argentina	39	65	57%
Colombia	186	79	58%	Mexico	25	57	53%
Mexico	220	94	57%	Uruguay	49	68	53%
Panama	130	58	55%	Chile	29	57	50%
Chile	261	118	55%	Colombia	29	57	50%
				Paraguay	25	55	50%
				Brazil	29	55	46%
				Guatemala	24	46	36%
				Bolivia	26	43	29%

Notes and Sources

1. Infant deaths per 1000 live births. Source: Collver 1965. Hollerbach and Díaz-Briquets (1983: 5) regard Collver's 1900 infant mortality estimate for Cuba (136 per 1000) as an underestimate. As noted in the text, more plausible estimates suggest a rate closer to 195 per 1000, which would imply a decline from 1900 to 1960 of 80 percent rather than 71 percent. Collver's statistics for Argentina and Costa Rica conform more closely to those derived from alternative sources, whereas alternative estimates for Chile are, like those for Cuba, considerably higher (270, 340), although not so high as to raise Chile's percent decline estimate above 65 percent. See text for details.

2. Source: Hill et al. 1999.

3. Calculated from columns 1 and 2; percent decline is toward a stipulated minimum of 0.

4, 5. Source: Astorga and FitzGerald 1998.

6. Calculated from columns 4 and 5; percent increase is toward a stipulated maximum of 85 years.

Table 7

Modernization Indicators circa 1960

Infant mortality		Life expectancy		Fertility		Urbanization		GDP per capita		Calorie availability		Gini index (inequality)	
Cub	39	Uru	68.0	Uru	2.9	Uru	80	Ven	9,646	Arg	3,073	Uru	39.5
Uru	48	Arg	65.2	Arg	3.1	Arg	74	Arg	5,559	Uru	2,794		
Ven	56	**Cub**	64.2	**Cub**	4.2	Chi	68	Uru	4,960	Chi	2,531		
Pan	58	Par	63.9	Chi	5.3	Ven	61	Chi	4,320	Nic	2,523	Ven	44.8
Arg	60	Cos	61.9	Pan	5.9	**Cub**	55	Mex	3,155	Mex	2,490	Arg	46.2
Par	67	Pan	60.9	Bra	6.2	Mex	51	**Cub**	3,118	Par	2,404		
Col	79	Ven	59.8	Hai	6.3	Col	48	Per	3,023	Bra	2,320	Cos	50.0
Cos	87	Chi	57.3	Ven	6.6	Per	46	Cos	2,715	**Cub**	2,297		
Mex	94	Mex	57.3	Bol	6.7	Bra	45	Col	2,497	Per	2,223	Bra	53.0
Dom	102	Col	56.8	Ecu	6.7	Pan	41	Pan	2,391	Cos	2,197		
Ecu	107	Bra	54.9	Col	6.8	Nic	40	Bra	2,335	Ven	2,187	Mex	55.1
Bra	115	Ecu	53.4	ElS	6.8	Bol	39	Ecu	2,290	Pan	2,169	**Cub**	57.1
Chi	118	Dom	52.2	Mex	6.8	ElS	38	Gua	2,262	Col	2,165		
ElS	129	ElS	50.8	Par	6.8	Cos	37	Nic	1,983	Ecu	2,034		
Nic	130	Per	48.0	Gua	6.9	Par	36	ElS	1,769	Hai	2,028		
Gua	136	Nic	47.3	Per	6.9	Ecu	34	Bol	1,606	Hon	1,927		
Hon	137	Hon	46.6	Cos	7.0	Gua	32	Par	1,555	Gua	1,927		
Per	142	Gua	45.9	Dom	7.4	Dom	30	Hon	1,398	Dom	1,850	Per	75.8
Bol	152	Bol	42.8	Nic	7.4	Hon	23	Dom	1,332	ElS	1,840		
Hai	169	Hai	42.4	Hon	7.5	Hai	16	Hai	1,055	Bol	1,798		

Notes and Sources:

Infant mortality: Infant deaths per 1000 live births. In 1960, from Hill et al. 1999.

Life expectancy: In years, at birth. In 1960, from World Bank 2002.

Fertility: Total fertility rate, the number of children a woman reaching the age of 15 in 1960 would be expected to bear in her lifetime. In 1960, from UNICEF 1997: 96-97.

Urbanization: Proportion of population in urban areas (defined differently in different countries). In 1960, from World Bank 2002.

GDP per capita: In 1990 international Geary-Khamis dollars. In 1960, from Maddison 1995: 288-290.

Calorie availability: In kcal per capita per day. In 1961-63, from Wilkie, Alemán, and Ortega 1999: 200. Data for El Salvador and Nicaragua are from 1966-68. In the 1990s, the Food and Agriculture Organization recommended minimum for Latin America was 2,200 kcal per capita per day.

Gini index: A measure of income inequality, with 0 lowest and 100 highest. Figures from 1953-1962 (Cuba figure from 1953), from Deininger and Squire 1998. Venezuelan and Uruguayan figures are weighted means of separate urban and rural figures.

Table 8

GDP per capita, 1900 and 1960, in 9 Latin American Countries

Ranked from Lowest to Highest Increase in GDP per capita from 1900 to 1960

	GDP per capita in 1900, Astorga and FitzGerald	GDP per capita in 1960, Astorga and FitzGerald	Multiple by which 1960 exceeded 1900 GDP per capita	GDP per capita in 1960, Maddison	Maddison divided by Astorga/ FitzGerald 1960 estimate
Note	1	2	3	4	5
Venezuela	106	1,128	10.64	9,646	8.55
Peru	104	485	4.66	3,023	6.23
Brazil	71	324	4.56	2,335	7.21
Colombia	118	420	3.56	2,497	5.95
Ecuador	89	285	3.20	2,290	8.04
Chile	283	679	2.40	4,320	6.36
Mexico	261	611	2.34	3,155	5.16
Argentina	439	852	1.94	5,559	6.52
Cuba	272	390	1.43	3,118	7.99

Notes and Sources

Cols. 1 and 2: Astorga and FitzGerald 1998: 31. All figures GDP per capita in 1970 $US at PPP according to a chain index, 3 year average.

Col 3: Calculated from Astorga and FitzGerald 1998: 31.

Col. 4: Maddison 1995: 288-290. In 1990 international Geary-Khamis dollars.

Col. 5: Column 4 divided by column 2.

Table 9

Urbanization in Cuba, 1899-1953

Year	Population of Cuba	Pop. in the 25 largest cities	Population in Havana metro. area	% pop. in 25 largest cities	% pop. in Havana metro. area	% pop. in the city of Havana
1899	1,572,797					16.1
1907	2,048,980	628,600	367,900	31	18.3	14.8
1919	2,889,004	919,300	472,900	32	16.5	12.6
1931	3,962,344	1,346,100	728,500	34	18.5	13.7
1943	4,778,583	1,744,100	947,000	36	20.0	14.2
1953	5,829,029	2,281,000	1,223,900	39	21.3	13.5

Source: Luzón 1987: 54, 116, except for % of population in the metropolitan area and city of Havana, which come fron Díaz-Briquets 1983: 46. Both Luzón and Díaz-Briquets derive their figures from census data. Luzón's percentages for the Havana metropolitan area are close to Díaz-Briquets's.

Table 10

Age-Standardized Birth Rate, 1900-1959, in 8 Latin American Countries

	Cuba	Argentina	Chile	Mexico	Costa Rica	El Salvador	Honduras	Bolivia
1900-04	43.6	41.8	43.7	43.6	44.9			
1905-09	46.3	40.8	43.7	43.0	46.7			
1910-14	47.1	36.5	43.0	40.1	48.0			
1915-19	46.0	34.3	41.4	37.1	44.4			
1920-24	41.6	32.0	40.0	40.8	45.1			
1925-29	35.7	32.0	41.3	40.1	46.9			
1930-34	32.5	28.2	37.8	40.7	45.3	44.0	40.9	
1935-39	30.7	24.8	36.2	41.8	43.9	43.4	41.9	
1940-44	30.3	24.4	36.3	43.3	43.4	43.6	44.8	
1945-49	28.9	23.7	35.3	44.6	43.3	43.7	46.1	
1950-54		24.5	35.6	46.0	46.4	47.6	48.6	45.1
1955-59		23.8	38.7	48.2	48.5	49.1	49.9	40.7

Source: Collver 1965: 26-28.

Table 11

Estimated Total Fertility Rate in Cuba, 1899-1964

Year	TFR
1899	4.01
1907	5.82
1919	5.79
1931	4.50
1943	4.00
1950-54	4.01
1955-59	3.76
1960-64	4.67

Note: The total fertility rate is the number of children a woman would be expected to bear in her lifetime were she to bear children in accordance with the age-specific fertility rates prevailing in the year indicated.

Source: Hollerbach and Díaz-Briquets 1983: 5, 15. Hill (1983) estimates that the total fertility rate in 1950-54 was 3.6.

Table 12

Literacy as a Percentage of the Population Aged 10 and Over, Cuba, 1899-1953

Year	Literacy, total	Literacy, female
1899	43.2	38.1
1907	56.6	54.6
1919	61.6	61.0
1931	71.7	73.7
1943	77.9	72.8
1953	76.4	78.8

Source: Díaz-Briquets 1983: 45 for total literacy; Losada 1999: 201 for female literacy. Based on census data.

Table 13

Literacy as a Percentage of the Population Aged 15 and Over in 1900, 1960, and 1995, in 18 Latin American Countries

Ranked by percent rise in literacy from 1900 to 1960

	Literacy 1900	Literacy 1960	Literacy 1995	Literacy rise 1900-1960	Literacy rise 1960-1995
Argentina	51	91	96	82%	56%
Uruguay	59	90	97	76%	70%
Costa Rica	36	83	95	73%	71%
Chile	44	84	95	71%	69%
Panama	17	73	91	67%	67%
Cuba	46	79	97	61%	86%
Paraguay	31	73	92	61%	70%
Colombia	34	70	91	55%	70%
Mexico	24	65	90	54%	71%
Ecuador	33	66	90	49%	71%
Peru	24	60	89	47%	73%
Venezuela	28	62	91	47%	76%
Brazil	35	60	83	38%	58%
Bolivia	19	44	83	31%	70%
El Salvador	26	48	76	30%	54%
Guatemala	12	36	64	27%	44%
Honduras	28	45	70	24%	45%
Haiti	8	16	45	9%	35%

Source: Astorga and Fitzgerald 1998. The data, drawn from national censuses, are taken from an unpublished paper by consultants to the Inter-American Development Bank. All of the figures reportedly use as the denominator of the literacy rate the number of persons aged 15 and older, except the 1900 figure for Argentina, where 14 years of age is the cut-off point. Astorga and Fitzgerald (1998: 27) list several census estimates with a different age cut-off, and indicate that the consultants adjusted the estimates from these censuses to 15 and over using ratios from censuses in countries with similar demographic and educational characteristics. Cuba, however, is not listed among the countries for which census results were adjusted in this way, even though the age-cut off in Cuba has traditionally been 10 rather than 15 years of age. Because Cuban 10 to 14 year-olds probably had a higher literacy rate in 1960 than Cubans aged 15 and older, the above figure may slighly exaggerate the literacy rate in 1960 of Cubans aged 15 and older.

Table 14

Health Personnel and Health Facilities circa 1957 in 20 Latin American Countries

Doctors per 10,000 inhabitants		Nurses per 10,000 inhabitants		Nurse's aides per 10,000 inhabitants		Hospital beds per 1,000 inhabitants	
Argentina	12.8	Costa Rica	6.1	Chile	10.0	Argentina	5.3
Uruguay	11.6	Panama	5.8	Venezuela	8.5	Costa Rica	5.1
Cuba	10.0	Argentina	5.2	Argentina	8.3	Uruguay	5.1
Chile	6.2	**Cuba**	4.5	Costa Rica	8.3	Chile	5.0
Venezuela	6.2	Venezuela	3.4	Uruguay	8.0	Panama	3.9
Mexico	5.7	Chile	2.0	Panama	7.0	Venezuela	3.6
Paraguay	5.2	Peru	2.0	Brazil	5.9	Brazil	3.4
Brazil	4.0	El Salvador	1.7	El Salvador	5.0	Colombia	3.0
Costa Rica	3.7	Nicaragua	1.7	Colombia	4.4	Dom. Rep.	2.7
Peru	3.7	Guatemala	1.6	Paraguay	3.4	**Cuba**	2.6
Nicaragua	3.5	Mexico	1.6	Mexico	3.3	Guatemala	2.3
Colombia	3.4	Uruguay	1.6	Guatemala	2.6	Paraguay	2.2
Ecuador	3.4	Bolivia	0.6	Honduras	2.4	Peru	2.2
Panama	3.1	Brazil	0.6	**Cuba**	2.0	Ecuador	2.0
Bolivia	2.6	Haiti	0.6	Ecuador	2.0	Honduras	2.0
Honduras	2.1	Honduras	0.6	Peru	2.0	Nicaragua	2.0
Guatemala	1.6	Dom. Rep.	0.5	Dom. Rep.	1.7	Bolivia	1.8
Dom. Rep.	1.5	Ecuador	0.5	Nicaragua	1.4	El Salvador	1.4
El Salvador	1.4	Paraguay	0.5	Haiti	1.0	Mexico	1.0
Haiti	0.4	Colombia	0.3	Bolivia	0.8	Haiti	0.6

Source: PAHO 1988, except for health personnel in Mexico, where the figures (for 1961 in the case of doctors and 1962 in the case of nurses and nurse's aides) are from PAHO 1964: 63, 66. The nurse's aides figure for Uruguay was recorded as 80.0 (PAHO 1988: 80). This figure is presumed to be a misprint, and is recorded in the table as 8.0 (Uruguay in 1962 had 10.0 nurse's aides per 10,000 inhabitants; PAHO 1964: 66).

Table 15

Physician Availability in Cuba, 1899-1953

Year	Population per doctor, Cuba	Population per doctor, Havana province	Population per doctor, Oriente province
1899	1,286	649	2,625
1907	1,648	805	3,610
1919	1,631	691	4,630
1931	1,958	696	3,155
1943	1,846	556	3,140
1953	940	400	2,490

Sources: Figures for Cuba from Díaz-Briquets (1983: 50); figures for the provinces of Havana and Oriente from Losada (1999: 197). Losada's figures for Cuba as a whole are identical to Díaz-Briquets's for all years except 1931 (1,559 persons per doctor) and 1943 (1,324 persons per doctor). The 1943 census put the population of Cuba at 4,778,583 (Table 7) and the number of doctors at 2,589 (Cuba 1943: 1112). These figures work out to 1,845 persons per doctor, almost exactly the figure reported by Díaz-Briquets. Hence, we have used Díaz-Briquets's national series in preference to Losada's.

Table 16

Labor Union Membership in 20 Latin American Countries, 1946 and 1960

Ranked in order of union members as a share of economically active population, 1960

	Economically Active Population (EAP), 1946	Union Members, 1946	Union members as a percent of EAP, 1946	Economically Active Population (EAP), 1960	Union Members, 1960	Union members as a percent of EAP, 1960	ILO conventions signed as of 1961 (of 116 possible)
Venezuela	1,705,000	200,000	12%	2,363,890	1,500,400	64%	19
Cuba	**2,132,000**	**300,000**	**14%**	**2,513,203**	**1,503,795**	**60%**	**64**
Argentina	7,106,000	500,000	7%	8,110,334	2,576,186	32%	56
Chile	2,307,000	350,000	15%	2,559,331	492,900	19%	36
Mexico	9,050,000	1,000,000	11%	11,079,810	2,101,045	19%	47
Uruguay	930,000	75,000	8%	1,029,413	197,118	19%	57
Dom. Rep.	776,000	25,000	3%	998,379	188,000	19%	22
Peru	2,584,000	350,000	14%	3,177,920	550,000	17%	26
Bolivia	1,152,000	70,000	6%	1,331,687	200,060	15%	6
Brazil	18,863,000	500,000	3%	24,965,050	2,500,000	10%	29
Costa Rica	295,000	30,000	10%	359,497	23,000	6%	17
Ecuador	1,222,000	75,000	6%	1,501,270	84,800	6%	6
Colombia	4,431,000	150,000	3%	5,370,640	330,071	6%	25
Panama	306,000	25,000	8%	376,309	15,000	4%	11
El Salvador	677,000			829,343	36,012	4%	4
Nicaragua	403,000	25,000	6%	500,071	16,000	3%	30
Paraguay	572,000	25,000	4%	646,174	20,000	3%	0
Honduras	496,000			653,430	18,150	3%	11
Guatemala	1,062,000	50,000	5%	1,350,590	16,000	1%	34
Haiti	1,999,000	15,000	1%	2,138,228	9,517	0%	0

Sources:

Economically active population in 1946: ILO 2003; in 1960: World Bank 2003.

Union members in 1946: Alba 1968: 211, drawing on Robert J. Alexander, Labour Movements in Latin America.

Union members in 1960: Golomb and Dolkart 1962: 40, drawing on US Bureau of International Labor Affairs, Directory of Labor Organizations, Western Hemisphere. Data from c. Jan 1960; later where available and earlier if necessary. For a critique of data compiled by the US Bureau of International Labor Affairs, see McGuire 1997: 335-36, n. 15

International Labour Organisation conventions signed: Alba 1968: 214.

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