

## REVIEW

# Health in Cuba

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The poorer countries of the world continue to struggle with an enormous health burden from diseases that we have long had the capacity to eliminate. Similarly, the health systems of some countries, rich and poor alike, are fragmented and inefficient, leaving many population groups underserved and often without health care access entirely. Cuba represents an important alternative example where modest infrastructure investments combined with a well-developed public health strategy have generated health status measures comparable with those of industrialized countries. Areas of success include control of infectious diseases, reduction in infant mortality, establishment of a research and biotechnology industry, and progress in control of chronic diseases, among others. If the Cuban experience were generalized to other poor and middle-income countries human health would be transformed. Given current political alignments, however, the major public health advances in Cuba, and the underlying strategy that has guided its health gains, have been systematically ignored. Scientists make claims to objectivity and empiricism that are often used to support an argument that they make unique contributions to social welfare. To justify those claims in the arena of international health, an open discussion should take place on the potential lessons to be learned from the Cuban experience.

**Keywords** Cuba, public health, developing countries, international aid

## What is up with Cuba?

Cuba remains an enigma to North Americans and Europeans alike. Two generations ago there was no society with the exception of Canada that was more tightly integrated into the US cultural and economic sphere.<sup>1–3</sup> After the revolution of 1959, however, Cuba acquired the pariah status of a wayward child and has been variously vilified in rhetoric, attacked militarily and economically, and consigned to cultural oblivion. Within the US academic community, Cuban dialogue has been maintained primarily by social scientists and historians, many of whom are second-generation Cubans.<sup>4–6</sup> Despite occasional 'discovery pieces' the biomedical literature in English has been almost entirely silent on the Cuban experience<sup>7–10</sup> and US government policy temporarily forbade publication of articles from Cuba by US journals or their foreign subsidiaries.

The historical context that explains the absence of Cuba from the global conversation on public health and medicine is self-evident. This absence cannot be dismissed as passive acquiescence of the health professions to the demands of *real politik*, however. The *raison d'être* of the health sciences is the discovery of new knowledge and the use of that knowledge to improve health. Both the professional and commercial reward structures within the discipline insure that evidence of a major advance will attract further sustained attention. This dynamic, however, is conspicuously absent from the debate on international health. While the undisputed priority in public health from a global perspective is the need to rescue the populations of poor countries from diseases we have been able to prevent or cure for many decades,<sup>11–13</sup> nothing is said of one of the most striking examples where that challenge has been most effectively met. This silence stands in stark contrast to the impassioned rhetoric of the many conferences, declarations, and gatherings of world leaders where the imperative to find solutions is so often reiterated.<sup>14–16</sup>

The unwillingness to take account of the Cuban experience, or to even view it as an alternative route through which some societies can move toward the universal goal of health promotion, represents an important oversight. The achievements in Cuba thereby pose a challenge to the authority of the biomedical community in countries that define the scientific

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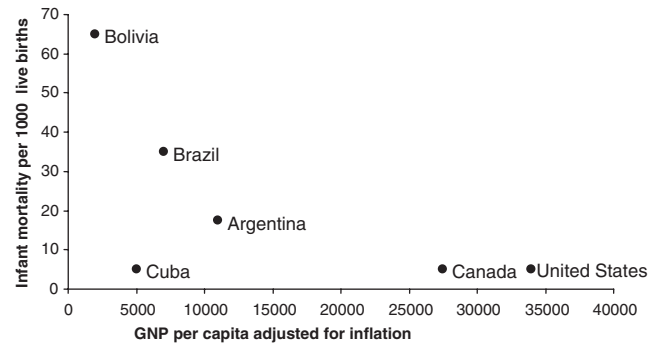
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agenda. This assertion by no means rests exclusively on Cuba's success in climbing the vital statistics charts. In virtually every critical area of public health and medicine facing poor countries Cuba has achieved undeniable success; these include most prominently—creating a high quality primary care network and an unequaled public health system, educating a skilled work force, sustaining a local biomedical research infrastructure, controlling infectious diseases, achieving a decline in non-communicable diseases, and meeting the emergency health needs of less developed countries. In the following discussion, we attempt to substantiate these claims with evidence and speculate on some of the implications of having allowed the debate over the Cuban experience to be silenced.

## Economic growth and the public health experience in Cuba

The public health experience in Cuba has several distinctive features. Although economic productivity is an important determinant of population health, Cuba does not conform to the expected relationship. International agencies like the World Bank have suggested that per capita income in Cuba is under \$1000 per year; Cuban estimates, which take account of subsidies, are higher, in the range of \$2–5000 per year.<sup>18</sup> Using either measure, however, when health outcomes are correlated with GNP, Cuba clusters with North America on the former scale and countries like Bolivia on the latter (Figure 1). Abrupt economic disruptions also provide evidence on how social forces shape population health. The economic crisis which began in 1991 after the withdrawal of the Soviet Union wreaked havoc on many aspects of Cuban society. The impact on health indices was relatively modest and short-lived, however, further demonstrating that economic measures alone are poor predictors of physical well-being within a society. One potential explanation of this anomalous pattern may be the relative absence of extreme poverty, which is the most powerful economic correlate of ill health and can confound the effect of average GNP. Cuba has a high degree of income equality and lacks the marginalized slum populations of most of Latin America, although the growing dependence on the tourist economy and, to a lesser extent, foreign remittances has widened the income distribution.

While useful for descriptive purposes, correlations of social indicators among countries require strong assumptions about the accuracy and comparability of the measures. This device should therefore serve only to frame the question of Cuban exceptionalism. The most striking feature of the Cuban health experience has, in fact, been the broad range of successes, many of which would not be captured by vital statistics data (Table 1). A heavy investment in biotechnology or foreign assistance, for example, would not be expected to have any near-term impact on the health status of the domestic population. Progress across this range of disparate challenges reflects a broad policy initiative rather than a narrow, goal-oriented programme. Rather than viewing health as a product of economic development, the well-being of the population has provided the target against which to gauge achievements in economic and cultural development.



**Figure 1** Infant mortality and gross national product (GNP) in selected Latin American countries and the United States, 2003

**Table 1** Indicators of Cuba's accomplishments in public health

First country to eliminate polio—1962
First country to eliminate measles—1996
Lowest AIDS rate in the Americas
Most effective dengue control programme in the Americas
Comprehensive health care; 1 physician per 120–160 families
Highest rates of treatment and control of hypertension in the world
Reduction in cardiovascular mortality rate by 45%
Crude infant mortality rate of 5.8 per 1000
Development and implementation of a 'comprehensive health plan for the Americas'
Free medical education for students from Africa and Latin America
Support of 34 000 health professionals in 52 poor countries
Creation of a national biomedical internet grid ( <i>INFOMED</i> )
Indigenous biotechnology sector; producing the first human polysaccharide vaccine

## The Cuban public health infrastructure

The 1959 Cuban revolution inherited a heterogeneous health sector. A single university hospital and medical school existed alongside a dominant private sector and a rudimentary public system.<sup>19–21</sup> Two-thirds of the 6300 physicians lived in Havana.<sup>21</sup> 'Mutual aid' health facilities served employed groups, especially in the cities, while primary care for the poor and rural population was weak or non-existent.<sup>19–21</sup> By the mid-1960s 3000 physicians had left the island, primarily for the US, and the various elements of curative medicine and traditional public health were gradually incorporated into a single structure organized under the Ministry of Public Health.<sup>21</sup> In the early stages emphasis was placed on basic public health improvements, such as sanitation and immunization, and medical care was extended to the rural areas.<sup>20</sup> A system of regional polyclinics and hospitals subsequently evolved, complemented in the 1980s by a reorientation of the entire system toward primary care and the education of large numbers of family doctors. By the 1990s the strategic goal was reached whereby a team of a family physician and a nurse lived on every block and provided care for 120–160 families.<sup>19,20</sup> At present there are 31 000 family physicians, with a total doctor:population ratio of 1 : 170.<sup>22</sup>

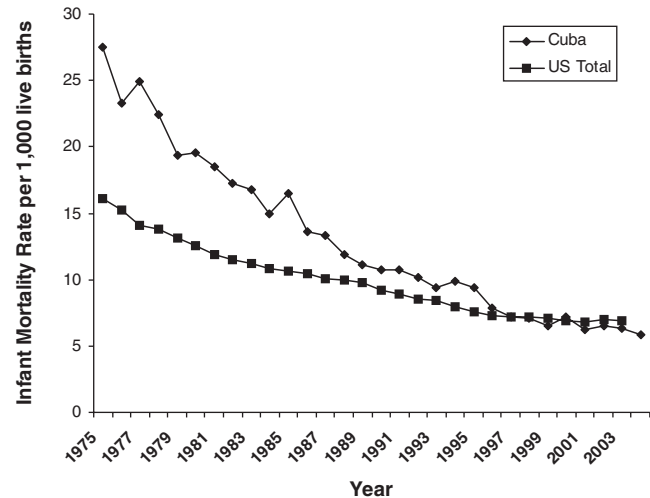
The most basic infrastructure requirement for progress in public health is a surveillance system that generates accurate and timely information. Some observers are skeptical of the Cuban data, suspecting that a political message is being transmitted in the vital statistics. In contrast to all other Caribbean and most Latin American countries Cuba has published extensive mortality and morbidity data by cause and province since 1970.<sup>22–24</sup> National data are presented promptly, currently within the first 3 months of the following year for some causes. High autopsy rates lend support to clinical diagnoses and the number of deaths attributed to ill-defined causes is very low (0.7%), an important indicator of incomplete or inaccurate vital statistics.<sup>22,25</sup> Based on comparisons to demographic models that predict expected rates, under-reporting in other Caribbean countries generally ranges from 10 to 20%, yielding falsely low mortality estimates.<sup>26</sup> Given the extensive vital statistics tables presented for Cuba by age, gender, cause, and region, manipulating the original counts while maintaining consistency across categories would be extremely difficult. In the case of the infant mortality statistics, for example, in 1965 only 54% of infant deaths were reported overall, and only 30% in the rural areas.<sup>20,21,24</sup> At the present 99% of infant deaths are reported from hospitals on the day of occurrence.<sup>20,24</sup> The patterns of variation for provincial and national estimates are what would be expected in a complex vital records system (i.e. counts and trends are consistent over time and region, subunits sum to the national rate, no excessive smoothing or discontinuities are observed, etc.).<sup>22</sup>

Cuba spends ~16% of its GNP directly on the health system, roughly \$320 per year per person. As would be expected, tertiary medical facilities lack both the amenities and the technology found in industrialized countries. A recent modernization campaign, however, has brought interventional cardiology and MRI, for example, to the 48 referral hospitals and ultrasound and endoscopy to polyclinics. Cost-effective interventions, like dialysis and organ transplantation, have been widely available for a number of years.<sup>27,28</sup>

In relative terms, Cuba has invested heavily in biotechnology, focusing on biopharmaceuticals.<sup>29–31</sup> With consistent state support, even during the collapse of the Soviet partnership, a robust local infrastructure has been created which now generates significant export income and has been characterized as 'the envy of the developing world'.<sup>29</sup> Production of the first vaccine for meningitis B and a vaccine for *Haemophilus influenzae* type b, which for the first time incorporated a synthetic antigen, are two of the most important recent accomplishments.<sup>30</sup> A recent initiative between a US corporation and the Center for Molecular Immunology in Havana to work jointly on a cancer vaccine reflects the growing international importance of this research.<sup>31</sup> Linkage to an organized health system provides an efficient mechanism to conduct trials and assess clinical applications, further enhancing the productivity of the biotech sector.<sup>29</sup>

## Maternal and child health

Established in 1970, the centralized Maternal–Child Programme (*Programa Nacional de Atención Materno-Infantil—PAMI*)



**Figure 2** Trends in infant mortality, Cuba and the United States, 1975–2004

has the main responsibility for assuring the health of women of child-bearing age and their children. With PAMI's leadership, governmental sectors as well as community organizations work collaboratively to provide a supportive network of community-oriented services. The success of this approach can be evaluated against a series of key indicators. Cuba's statistical time series for infant mortality documents one of the most rapid declines ever recorded (Figure 2). Since 2002 Cuba has had the second lowest infant mortality in the Americas, 20% below the US rate for all ethnic groups and just below the rate for US whites (Figure 2; Table 2).<sup>22,32,33</sup> The prevalence of low birth weight was 5.5% in 2004.<sup>22</sup> Thirty-five per cent of the Cuban population is black or *mulatto*, yet the infant mortality rate is less than half of what is observed in US blacks (Table 2). National data are not systematically analysed by race; however, in a study from the province of Cienfuegos no differences in pre-term birth or mean birth weight were noted between blacks and whites.<sup>33</sup>

International comparisons of infant mortality rates are potentially biased by definitions, reporting practices, and differential use of technology, thus the rank order of countries within a narrow range should be interpreted cautiously.<sup>35,36</sup> While Cuba adheres to WHO reporting recommendations and attempts to resuscitate all live births, the perinatal mortality rate is higher than is found in industrialized countries,<sup>22</sup> suggesting a potential shift in events from infant to fetal deaths. Even with careful attention to case definitions comparisons are difficult since technological interventions, particularly in the US, result in the live delivery of more very low birth weight babies.<sup>36–38</sup> However, the slope of the infant mortality decline is potentially less biased and by this measure Cuba compares favourably with societies with the best reproductive health records (e.g. Japan, Sweden, and Singapore). Although maternal deaths are rare events, the 2003 rate in Cuba was 39.5 per 100 000 live births; in Canada and the United States maternal mortality is 7–8 per 100 000 overall, and 20 among black women in the US.<sup>22,39,40</sup>

The resilience of Cuba's child health programmes was tested in 1991–94 when the collapse of the trading partnership

**Table 2** Infant mortality in Cuba and selected countries in the Americas, 2004

Country	Rate, per 1000
Canada	5.4 <sup>a,b</sup>
Cuba	5.8 <sup>a,c</sup>
US Total	7.1 <sup>d,e</sup>
Cuban American	3.7 <sup>f,g</sup>
Mexican American	5.4 <sup>f,g</sup>
White (non-Hispanic)	5.8 <sup>f,g</sup>
Puerto Rican (mainland)	7.9 <sup>h,i</sup>
Puerto Rican (island)	10.2 <sup>h,i</sup>
Blacks (non-Hispanic)	12.8 <sup>f,g</sup>
Chile	7.8 <sup>a,c</sup>
Argentina	16.5 <sup>a,c</sup>
Mexico	12.5 <sup>i,c</sup>
Brazil	25.1 <sup>a,g</sup>
Dominican Republic	35.4 <sup>a,c</sup>
Bolivia	54.0 <sup>a,c</sup>

<sup>b</sup> 2000; <sup>c</sup> 2004, preliminary data; <sup>e</sup> 2003, preliminary data; <sup>g</sup> 2002; <sup>i</sup> 1998–2000.

<sup>a</sup> Available at: <http://www.paho.org/english/dd/ais/BI-brochure-2005.pdf> (Accessed March 10, 2006).

<sup>d</sup> Available at: [http://www.cdc.gov/nchs/data/nvsr/nvsr53/nvsr53\\_15.pdf](http://www.cdc.gov/nchs/data/nvsr/nvsr53/nvsr53_15.pdf) (Accessed March 10, 2006).

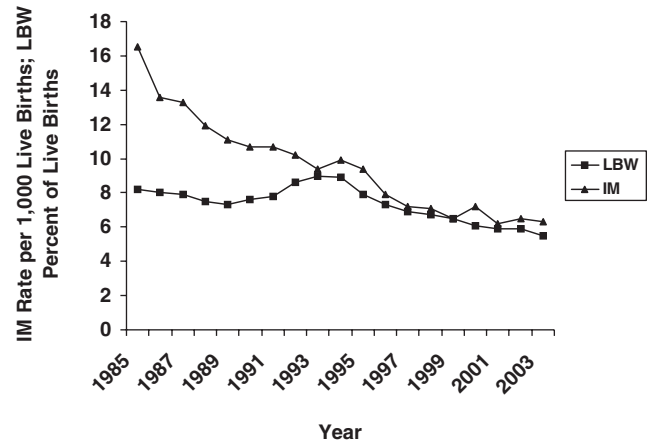
<sup>f</sup> Available at: [http://www.cdc.gov/nchs/data/nvsr/nvsr53/nvsr53\\_10.pdf](http://www.cdc.gov/nchs/data/nvsr/nvsr53/nvsr53_10.pdf) (Accessed March 10, 2006).

<sup>h</sup> Available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5242a2.htm#tab2> (Accessed March 10, 2006).

<sup>j</sup> Available at: <http://www.inegi.gob.mx/est/contenidos/espanol/rutinas/epi.asp?t=mpob55&c=3232> (Accessed March 10, 2006).

with the Soviet Union and the tightening of the US embargo provoked the unprecedented economic crisis known as the 'special period'.<sup>41–44</sup> The economy contracted by 30% and access to foreign commodities—including everything from oil to pharmaceuticals and agricultural inputs—was virtually cut-off. An epidemic of optical and peripheral neuropathy, subsequently traced to a sharp decline in protein, vitamins, and some other micronutrients, afflicted 50 000 Cubans.<sup>42</sup> During this period a modest increase in mortality from infectious diseases, particularly tuberculosis, was also observed.<sup>22</sup> A variety of internally generated initiatives, like small-scale organic farming and return to the use of draft animals, allowed the society to regain food security and redirect the economy.<sup>45</sup>

As would be anticipated in a period of severe food shortage, the incidence of low birth weight increased, accompanied by a modest rise in infant mortality (Figure 3). While average calorie intake was reduced from 3000 to 1800 kcal/day,<sup>42,45</sup> supplemental food for pregnant women was available through cafeterias in work places and 'maternity houses'. Within 2 years, well before the economy overall had recovered, the health of child-bearing age women and infants had experienced 'catch-up' and the trajectory of the decline in infant mortality was regained. Maintaining social cohesion and high public health standards while simultaneously undertaking a coordinated economic reorganization of that magnitude posed enormous technical and social challenges.

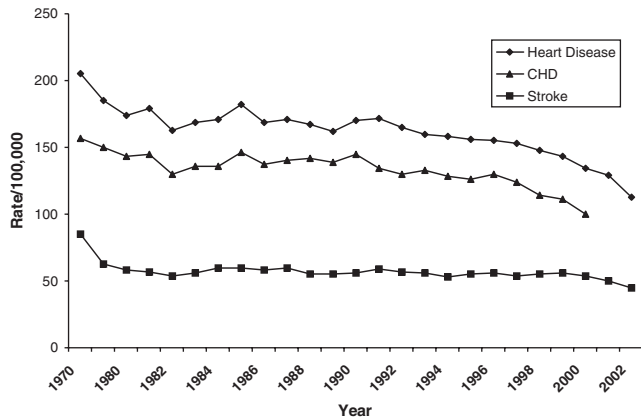
**Figure 3** Trends in low birth weight and infant mortality in Cuba, 1985–2003

## Cardiovascular disease and cancer

Considerable attention has been focused on the threat posed by non-communicable diseases in developing countries.<sup>46,47</sup> More than two-thirds of cardiovascular (CV) deaths are already occurring in poor countries of Asia, Africa, and South America, and risk factors are increasing rapidly, leading to dire predictions about the size of the coming epidemic.<sup>48,49</sup> Unfortunately, the epidemiologic data required for an accurate description of the trends in mortality and causal risk factors are not available for most countries in these regions, nor has evidence emerged to support prevention and control strategies that can be used effectively in low resource settings.

Cuba provides a unique opportunity to study the CV epidemic in the non-industrialized world because of its robust public health data system. CV diseases have been the leading cause of death since at least 1970<sup>22,50</sup> and within its resource limitations the medical care system has responded vigorously. For example, all major classes of anti-hypertensives are produced locally and the levels of treatment and control of hypertension are the highest reported for any country.<sup>51–53</sup> A sustained downward trend in coronary heart disease began in 1982 with a slope close to the maximum achieved in Europe and North America (~1.5% per year) (Figure 4) and the cumulative reduction in age-adjusted mortality reached 45% by 2002.<sup>50</sup> Acute care for myocardial infarction meets international standards and pre-hospital treatment units exist in most municipalities. Locally manufactured recombinant streptokinase is used routinely; at present, based on data from at least one province, the total thrombolysis rate is >60% and the 'door-to-needle time' is 30 min or less for >90% of all patients with ST elevation on the electrocardiogram.<sup>54</sup> This experience demonstrates that non-industrialized countries can in fact move decisively to prevent and control CV diseases without accumulating the extraordinary medical technology and infrastructure of Europe and North America.

Less progress has been made in the control of cancer, consistent with the experience in industrialized countries. The age-adjusted death rate from all malignancies combined rose from 115.9 per 100 000 in 1988 to 125.6 in 2003.<sup>22</sup> Lung and prostate are the two most common causes of cancer death,



**Figure 4** Age-adjusted mortality from cardiovascular diseases, Cuba, 1970–2002

followed by breast and colorectal cancer.<sup>55,56</sup> Some progress has been made against tobacco. Smoking rates fell by one-third over the past two decades—average per capita consumption of cigarettes was down from 2690 in 1970–72 to 2280 in 1990–92, and the prevalence of smokers declined from 53 to 36%—although serious obstacles remain.<sup>57</sup> Prohibitions against smoking in public places, for example, are generally ignored and the limited success against smoking relative to other public health challenges probably reflects a lack of political will and Cuba's special historical relationship to tobacco. In fact Cuba has shown signs of 'medicalizing' the strategy to control chronic disease and will need to translate earlier lessons on the value of prevention into this new domain.<sup>50</sup>

## Infectious diseases

The combination of high levels of community participation, access to primary care and an aggressive public health approach has made the Cuban campaign against epidemic infectious diseases particularly successful.<sup>58–60</sup> A number of common illnesses have been eliminated altogether, often for the first time in any country [poliomyelitis (1962), neonatal tetanus (1972), diphtheria (1979), measles (1993), pertussis (1994), rubella and mumps (1995)]. In 1962, against the advice of external health officials, 'vaccination days' were established with the goal of reaching the entire population. When this method quickly proved to be effective in eliminating polio it was subsequently adopted elsewhere as the primary strategy.<sup>58</sup> After dengue was introduced in 1981 Cuba adopted a campaign of community mobilization, focusing on elimination of mosquito breeding sites, which lead to prompt control.<sup>20,58,59</sup>

International attention for infectious disease control in Cuba has focused primarily on HIV/AIDS.<sup>10,20,61–63</sup> Among 300 000 military personnel returning from Africa in the 1980s 84 were found to be infected with the virus [Ref. (20), p. 85]. A nation-wide screening programme which began in 1987 reached 80% of the sexually active population (~3.5 million people) and identified 268 HIV-positive individuals.<sup>20</sup> In the initial phases, the Cuban HIV/AIDS strategy provoked controversy, some of which was negative.<sup>20,64</sup> While assessing

the public health impact of this unknown epidemic, persons infected with HIV were quarantined in health facilities where they received supplemental nutrition and available medical care.<sup>20,61,62</sup> Treatment is now provided in the outpatient setting; domestically produced triple therapy has been provided free to all paediatric patients since 1998 and to adults with HIV or AIDS since 2000.<sup>62</sup> With the rapid increase in foreign tourists, and the development of a local sex trade, the HIV incidence has risen in the past 5 years, although it remains the lowest in the Americas.<sup>23</sup> Increased integration into the global economy may continue to pose challenges which Cuban public health has not previously had to address.

## Cuba's role in global health assistance

Given its limited economic resources, Cuba can only rarely afford direct aid.<sup>20</sup> Instead it has adopted a strategy that relies on human resources. First targeted to Africa, the programme has now placed physicians, nurses, dentists, and other professionals in 52 countries.<sup>20,65,66</sup> The most prominent episodes involved sending doctors to post-apartheid South Africa, providing long-term care for Chernobyl victims, and giving disaster aid to Central America after hurricane Mitch. Cuban personnel also staffed a new hospital in Gonaives, Haiti, which had been constructed with the Japanese aid; this facility was subsequently destroyed during the anti-Aristide strife in 2004 although the Cuban physicians have remained.<sup>67</sup>

To move from emergency assistance to a sustainable programme, a multicountry collaborative plan has recently been developed to improve health services in poor Latin American countries.<sup>66</sup> A medical school was established in Havana in 1999 and more than 6000 students, primarily from Africa and Latin America, are currently being given a medical education at no expense.<sup>7,68,69</sup> In the past 3 years more than 14 000 physicians and dentists have been placed in slums and rural communities in Venezuela as part of the new partnership between Cuba and the Chavez government, and this number is set to rise to 20 000.<sup>68</sup> Cuba has also agreed to educate 40 000 new physicians for Venezuela over the next several years.<sup>69</sup>

Cuba's medical assistance campaign has a number of dimensions. Like all foreign aid programmes, it assumes that some political benefits will be forthcoming in return. However, most of the countries that have been assisted, for example, Ethiopia, The Gambia, and Haiti, have nothing to offer in return. Unlike many donor programmes, placing physicians where none have practiced before has been overwhelmingly well received by the local communities.<sup>69</sup> Thus, while the arrangement with Venezuela has direct economic benefit to Cuba, it has also transformed the health system by giving large segments of the Venezuelan population access to modern medical care.<sup>69</sup>

The special character of health sector development in Cuba can perhaps be best appreciated by considering the challenge any other society would face if it tried to send tens of thousands of physicians to live in slum communities in a foreign country for 2 years. While a range of incentives and motivating factors unique to the Cuban social context are operating, these assignments are accepted as a professional obligation by the

vast majority of the Cuban practitioners and they perform effectively in the host communities. Much like the experience of military personnel on long tours of duty, the Cuban programme of assistance does nonetheless require extraordinary sacrifice and the hardship is not always borne lightly. Furthermore, the mobilization for assistance to Venezuela has meant that many Cuban neighbourhoods must share facilities. These sacrifices must, of course, be balanced against the conditions of desperate need in the communities on the receiving end. Many of these countries, particularly in Africa, have watched helplessly as the majority of their health professionals emigrate to the US and Europe.<sup>70</sup> Offhand dismissal by observers in industrialized countries of the Cuban medical aid programme, which has such a powerful impact on these marginalized communities, is a clear indication of how perilously divided the discourse over global development has become.

### Does Cuba's experience have broader significance?

The history of science is replete with stories of the delayed acceptance of unpopular or unfashionable ideas. The approach to improving global health taken by the donor community and academic medicine in rich countries is no exception. While criticisms of the basic approach are voiced—as in the recent assertion that the external measures of development have no meaning for the general population<sup>71,72</sup>—these critical voices have little influence on the practice of large international agencies. It is not the intent of this article, however, to summarize and make a judgment on economic assistance and progress in global public health. Instead, based on the weight of the evidence presented on the Cuban experience, we pose the following question: 'Why has the debate on solving the most urgent challenges in public health in poor countries ignored the experience of success?' Traditionally, whether the experience is derived from randomized trials, high survival rates in clinical series, or favourable trends in vital statistics, biomedicine embraces the winner and seeks to imitate it. Precisely the opposite has happened in this instance.

There is, of course, no shortage of historical and ideological reasons why a debate on the 'Cuban question' has never reached maturity. Blind optimism is thought to have discredited the sympathetic scholarship about the Soviet Union, and to a lesser extent China, in an earlier era.<sup>73–75</sup> Some observers are too concerned about putative restraints on civil liberties and the independent character of its foreign policy to develop any enthusiasm for the objectively more successful aspects of Cuban society. None of these concerns, however, undermine the force of the question, why have we ignored what works?

Before recommending components of the Cuban model for use in other settings, a thorough and balanced assessment of the strengths and weaknesses of those components would be required. That assessment would require a very different study of the health system's organization, capacity, and services. Our intent here is to demonstrate that sufficient cause exists to undertake that assessment. For an objective evaluation of the Cuban experience to succeed, an acceptance of certain ground rules would be required. First, this evaluation cannot be

undertaken with the goal of winning a political argument. Although the trajectory of social development in Cuba over the past 50 years is both complex and controversial, as in all other countries, the public health experience should be subjected to judgment on the basis of the usual rules of science. Second, this judgment cannot be permanently postponed by skepticism about the validity of the data or concern over unrelated broader social questions. Ongoing, careful scrutiny of Cuban public health data is justified and to be welcomed; however, sufficient data now exist in several key areas to demonstrate that skepticism can no longer be the basis for a refusal to engage the question. Likewise, many societies embrace domestic and foreign policies that are questioned and even condemned by broad segments of the world community, yet the attempt to evaluate progress in improving the health of their populations is not thereby condemned as illegitimate or unnecessary. Third, the apparent successes recorded by Cuba should be seen as consequences of a well-defined strategy; the value of these underlying principles, not the accumulation of better numbers, is what holds implications for other poor countries, and not a few well-resourced societies.

Two aspects of the Cuban experience serve as reasonable demonstrations of the value of that strategic approach. In the area of infectious disease, for example, the operative principles are particularly straightforward: once a safe and effective vaccine becomes available the entire at-risk population is immunized; if a vaccine is not available, the susceptible population is screened and treated; where an arthropod vector can be identified, the transmission pathway is disrupted by mobilizing the local community which in turn requires effective neighbourhood organization and universal primary health care. The joint effect of these strategic activities will result in the elimination or control of virtually all serious epidemic infectious conditions. In terms of child survival, a 'continuum of care' that provides for the pre-conceptual health of women, prenatal care, skilled birth attendants, and a comprehensive well-baby programme can quickly reduce infant mortality to levels approaching the biological minimum. Many observers will regard these propositions as reasonable, yet hopelessly too ambitious for the poorer nations of the world. It must be recognized, however, that these principles have been successfully implemented in Cuba at a cost well within the reach of most middle-income countries.

Although other aspects of society, such as education and housing obviously make independent contributions to the success of public health campaigns, the Cuban strategy outlined here serves as a model that should be thoroughly evaluated. Needless to say, its implementation would face many challenges specific to the geography and politics of a region. Other models that dictate public health strategies face the same gamut of uncertainties and challenges, however, and none can be said to have met with similar success.<sup>76</sup> The World Health Organization, for example, promulgated a set of principles in the Alma Ata 'Health for All' Declaration of 1978, many of which were incorporated into the Cuban approach.<sup>77</sup> In recent years, however, international agencies have favoured privatization and reduction in state support for health systems.<sup>78</sup> The record of achievement with privatized systems in poor countries has often been very limited.<sup>79</sup> A debate which can use as a point of departure extensive empirical evidence of

progress would provide a healthy reorientation in a discipline distracted by controversy and divided over political aims.

The health professions have little opportunity to intervene directly on historical events. However, in the conduct of our science we have both choice and responsibility. Challenging the acquiescence of the scientific community to ostracism of some of its members in an earlier era, Einstein remarked, 'Political considerations, advanced with much solemnity, prevent... the purely objective ways of thinking without which our great aims must necessarily be frustrated' [Ref. (80) p. 80]. If the accomplishments of Cuba could be reproduced across a broad range of poor and middle-income countries the health of the world's population would be transformed. This fact creates an obligation for health scientists. We should debate the merits of the principles embedded in the Cuban attempts to improve the health of populations.

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