Primary Care in Cuba: Low- and High-Technology Developments Pertinent to Family Medicine

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Cuba's accomplishments in primary care, while controversial, include several developments pertinent to family medicine. These accomplishments involve low-technology and organizational innovations such as neighborhood-based family medicine as the focus of primary care; regionalized systems of hospital services and professional training; innovative public health initiatives and epidemiologic surveillance; universal access to services without substantial barriers related to race, social class, gender, and age; and active programs in treatments such as "green medicine" and "thermalism." High-technology achievements include innovations in pharmacology and biotechnology, surgical procedures, and care of patients infected by the human immunodeficiency virus (HIV). Limited access to Cuban publications, impediments to presentations by Cuban health care professionals at professional meetings, and the prohibition on importing products of Cuban biotechnology to the United States inhibit a detached, scientific appraisal of Cuba's accomplishments. Cuba's isolation from the US clinical and research communities has prevented interchanges that would improve primary care services in both countries.

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Ninety miles from the United States, Cuba and its health care system remain mysterious and controversial for many primary care physicians. Partly because of US governmental restrictions on travel and importation of journals and medical products, clinicians and researchers face difficulties in appraising critically the policies and practices that have evolved in Cuban medicine.

As members of a study seminar from the American Public Health Association who visited Cuba in 1995 and 1996, we witnessed both problems and strengths of the health care system that are relevant to US medicine. As required under the federal restrictions that limit travel to Cuba for US citizens, we traveled to Cuba with a license approved by the Treasury Department. We were able to travel freely within Cuba and to make observations in local communities, hospitals, clinics, research institutes, and the first national sanitarium for patients with HIV. We visited several of these sites without prior notification. In some instances, we entered into discussions with persons who had opposed various aspects of Cuban governmental policies. We also conducted interviews in Spanish with officials and community leaders as part of an itinerary planned by officials of the Cuban Ministry of Public Health; we were free to deviate from this itinerary at will, did so on numerous occasions, and experienced no restrictions on our ability to pursue inquiries of interest to us, such as those that involved transportation by private automobile to provinces outside Havana. In addition, we reviewed current literature, including items identified by a MEDLINE search using the following key words: Cuba, medicine, and health.

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BACKGROUND

A well-organized and accessible health care system has enjoyed a high priority in Cuba since the revolution of 1959. Training programs have produced large numbers of physicians, nurses, and allied professionals, who practice in a system that assures access to services in even the most remote parts of the country. Curricula for these training programs have been developed centrally by the national Ministry of Public Health after input from educators and practitioners in all areas of the country; the curricula have been implemented in large part through decentralized training facilities, including medical schools that have been established in each of Cuba's provinces.[1,2(pp197-203)]

Because the production of physicians came to exceed the country's internal requirements (Cuba's physician-per-population ratio is 1 to 255, as compared with 1 to 430 in the United States),[3,4] Cuba has been able to export primary care physicians and specialists for periods of service in other Third World nations. Decisions to send physicians abroad have been in response to official requests by the governments of these countries. More than 10,000 Cuban physicians have served abroad, with as many as 1500 during a single period.[2(p157),5]

Efforts in preventive care have achieved greatly improved health indicators. For instance, the incidence of infectious diseases preventable by vaccines is lower than in any other nation at Cuba's level of economic development; immunization rates have remained for many years between 99% and 100% of the target populations.[6] During Cuba's recent economic crisis, the continued availability of vaccines has been facilitated through internal production of needed vaccines by Cuban biotechnology laboratories. Compliance is assured by routine epidemiologic surveillance at the neighborhood level by family physicians, in cooperation with the neighborhood-based mass organizations such as the Cuban Federation of Women and the Committees for the Defense of the Revolution. Such public health efforts have received wide recognition by international agencies including the World Health Organization and Pan American Health Organization; even critics of the Cuban political system have acknowledged Cuba's accomplishments in the medical field.[7-11]

The loss of Cuba's principal trading partners in eastern Europe and the US embargo have had a heavy impact on the health and well-being of the Cuban people.[12] Medications, medical supplies, and equipment have become difficult to obtain, even from western European, Canadian, and Asian firms that previously have traded with Cuba but fear sanctions imposed by the United States. Between 1991 and 1993, an epidemic of optic neuritis and polyneuropathy occurred in Cuba. Scientists from Cuba and other countries later confirmed that the epidemic developed from multiple causes, especially a rapid decline in food intake and other essential nutrients such as B vitamins.[13-21]

Since early 1994, economic conditions in Cuba have improved, partly as a result of planned joint investment partnerships with companies based in western Europe and Canada, as well as increased tourism. For instance, after declining between 10.7% and 14.9% annually between 1991 and 1993, Cuba's gross domestic product grew 0.7% in 1994 and 2.5% in 1995.[22] As a result, the severe problems of nutrition and disease that began to emerge in the early 1990s have eased considerably.[13] On the other hand, shortages of many medications, equipment, and replacement parts persist.

LOW-TECHNOLOGY AND ORGANIZATIONAL ACCOMPLISHMENTS

Family medicine, preventive services, and epidemiologic surveillance. After the revolution, the training of Cuban medical students and residents first proceeded along traditional lines, with physicians entering specialties of their choice after a 1-year period of obligatory service. Dissatisfaction due to crowding and discontinuities in staffing of local polyclinics arose in many communities. In response, the Ministry of Public Health developed during the mid-1970s a program of "Medicine in the Community." For this program, professors and residents in the primary care specialties maintained a regular base in local polyclinics.[2(pp37-40)]

Despite these changes, dissatisfaction persisted. As a result, in 1984 the government initiated the program of "Integral General Medicine" *(Medicina General Integral)*.[2(pp44-47),9,23-26] In this program, before they make their choices between generalist and specialist careers, all residents receive 3 years of training in family medicine. This training includes rotations in each primary care specialty (internal medicine, pediatrics, and obstetrics and gynecology), as well as a

longitudinal continuity experience based in a local neighborhood and supervised by family physicians. During their residencies, and afterward if they choose to remain family physicians, physicians live in the communities they serve, usually in an apartment within the same building that contains their practice site *(consultorio)*. In general, a family physician provides primary care and preventive services for 700 to 800 patients who live in the immediate vicinity of the practice.

Each family physician is required to see every patient in his or her catchment area at least twice a year. The physician maintains a record of preventive services and conditions for all patients in the catchment area; this record is updated and reviewed at least monthly with a clinical supervisor, who is an academically based family physician. The monitored services and conditions include prenatal care, immunizations, cancer screening by Papanicolaou smears and mammography, risk factors such as smoking and hypertension, and follow-up for chronic conditions, as well as psychosocial problems and sources of stress in the family or at work. Under this surveillance system, it is expected that all patients in the catchment area receive preventive services appropriate for their age, sex, and risk factors. In our observations, we found that the family physicians were knowledgeable and maintained surveillance records regarding all patients for whom they were responsible.

Family physicians are supported by a system of laboratories, referral centers, and consultation resources based in local polyclinics and municipal hospitals. When patients require admission, they enter a municipal, provincial, or national hospital as their conditions warrant. Unless a patient is transported to a provincial or national hospital outside the local area, the family physician travels personally to the referral hospital. There, he or she meets with specialists responsible for the patient's inpatient management, coordinates inpatient services to assure continuity after discharge, and maintains frequent contacts with the patient to enhance the long-term patient-physician relationship. For emergencies, especially in urban areas, patients can decide to bypass the local family physician and can receive services directly in the emergency departments of referral hospitals. In this situation the emergency department staff attempt to contact the patient's family physician for subsequent follow-up. Through this organizational structure, Cuban health policy favors local primary care services within an organized system of consultation and referral for more specialized care.

The focus on community-based family practice facilitates public health activities and epidemiologic surveillance. Data concerning acute and chronic illnesses pass sequentially from family physicians to the municipal, provincial, and national levels of the Ministry of Public Health. This surveillance system is computerized and linked throughout the country by modem and electronic mail. Computerized surveillance has been implemented at all provincial levels and is being extended to municipalities and rural health centers. The surveillance system rapidly clarifies such problems as the spread of infectious diseases, the changing distribution of chronic diseases, and unusual clinical conditions such as the epidemic of neuropathy that emerged between 1991 and 1993.[2(pp37-40),27,28] Such innovations may prove instructive for countries, including the United States, that lack efficient data gathering and reporting systems for preventive services and efforts in community-oriented primary care.[29-31]

Issues of race, class, sex, and age. The Cuban medical profession is fully integrated in proportion to the racial distribution of the population, as opposed to the situation before the revolution, when the great majority of Cuban physicians were white. In addition, there is no evidence of racial barriers that inhibit patients' access to diagnostic, curative, or preventive services.

On the other hand, to be successful in entering medical school, applicants must receive a strong recommendation from organizations in their local communities. Political criteria do enter into the selection process, focusing on the applicants' commitment to subsequent service. Although this political component of the selection process has attracted some criticisms inside Cuba and from foreign observers, the requirement that applicants present evidence of their communities' support has continued.

Because Cuban educational policies have encouraged recruitment of medical students from all regions and social categories, entrance into the profession by students from historically lower social class positions has increased markedly since 1959. As in other fields of study, medical students receive free education, with no personal out-of-pocket costs or debts. This policy has allowed students from fam-

ilies with modest incomes to enter the profession at a much higher rate than in other countries of Latin America, as well as in the United States and Europe.[2(pp26-31)]

Financial barriers to health care access have been eliminated. Medical services remain completely free, although small co-payments are expected for most medications purchased at pharmacies. Income differentials between the highest paid professional and the lowest paid worker in Cuba, at approximately 4 to 1, are much lower than in other countries. Nevertheless, as in economically advanced countries such as Canada and the United Kingdom whose national health systems assure universal access, [32-34] social class may continue to affect health status in Cuba. The recent neuropathy epidemic is one example; low income workers (especially frequent smokers) developed neuropathy somewhat more frequently than higher paid workers.[13]

Problems of gender bias have diminished. Currently 48% of Cuban physicians and 61% of family physicians are women.[35] Women have assumed positions of authority at all levels of the health care system.[36] Gender differences in the frequency of invasive diagnostic or therapeutic procedures have not been thoroughly studied in Cuba.

Geriatric medicine has received emphasis, partly because the control of infectious diseases contributed to a demographic profile resembling that of the United States and other economically developed countries.[37] During residency training, all physicians participate in geriatric rotations.[38] Family physicians and internists who elect to receive additional training in geriatrics provide services in the network of "old age homes" *(hogares de ancianos)* throughout the country. These institutions offer adult day care services; residential facilities for older single people and couples; exercise programs designed by a nationally coordinated program in exercise physiology; travel; and cultural activities.

One unique aspect of community participation in Cuban geriatric services involves the "grandparents' circles" *(círculos de abuelos)*. These groups emerged in the late 1970s, responding to a recognition that neighborhood-based organizations can provide an additional source of care and support for older people. Currently, within most Cuban neighborhoods, the grandparents' circles offer opportunities for daily social interaction, recreation, and service activities.[39,40]

"Green medicine" and other alternative treatments. Historically, community-based practitioners not trained in medical schools have offered alternative therapies based on traditionally used herbs and other plant materials, especially in the Afro-Cuban population. In some instances, Cuban scientists have investigated the pharmacologic basis of traditional herbal remedies.[41] During the 1990s, after extensive controversy and against the background of decreased availability of many medications due to the US embargo and loss of trade advantages with eastern Europe, so-called green medicine *(medicina verde)* has flourished.

The Ministry of Public Health has distributed to practitioners throughout the country a national formulary and educational materials on green medicine compiled by 17 prominent scientists in medicine and biology.[42] For each "medicinal plant," the formulary provides the following information: common names, scientific name, botanical family, physical description of the plant, worldwide geographical origin, location in Cuba, part of the plant to be used, instructions on collection and storage, clinical properties validated experimentally, pharmaceutical description, mode of administration, other attributed properties, side effects, other uses, chemical composition, cultivation, and preparation and dosage.* In most local clinics and hospitals, an illustrated list of recommended herbal treatments, posted in a prominent location, guides patients and physicians in obtaining remedies for conditions ranging from gastritis to musculoskeletal pain. In disseminating this information, the Ministry of Public Health has confined its recommendations to herbal treatments that have been proven safe and, based on a consensus judgment of leading physicians, are effective in the primary care setting.

Family physicians whom we interviewed described their initial reluctance, based on their training and clinical experience, to recommend treatments in green medicine. Over time, they reported, they have begun to initiate such treatments, especially when allopathic medications could not be obtained because of shortages, and generally have achieved satisfactory results.

"Thermalism" has emerged as another major arena of Cuban traditional medicine that has

*An appendix, which lists the 54 plants that the formulary describes and presents an illustrative description for one of these plants, is available on request to the first author.

returned to favor under recent conditions of austerity.[43] The recuperative characteristics of Cuba's more than 40 thermal sites became known to Spanish colonizers as early as the first part of the 17th century. Attitudes favoring this traditional therapy have been fostered by the recent economic crisis. The medical curriculum now includes principles of thermalism. In several provinces, certified physicians coordinate clinical services and research on the mineral properties of thermal sites. The specified indications for thermal treatment almost always include chronic conditions, especially rheumatologic and dermatologic disorders.[44]

Under the purview of the Ministry of Public Health, research to evaluate the clinical efficacy of herbal treatments and thermalism for specific diseases is in progress, both in Havana and in regional centers. The published and widely distributed lists of indications for certain plants to be used in specified diseases, however, are based on the consensus judgments of health professionals considered expert in the field, rather than extensive, laboratory-based tests of efficacy.

HIGH TECHNOLOGY AND RELATED CLINICAL ACCOMPLISHMENTS

Advances in pharmacology and biotechnology. Cuba also has achieved notable successes in high-technology fields, partly because of an explicit national policy encouraging focused development of biotechnology.[45] These accomplishments remain little known in the United States because of the economic and information boycott. For instance, at the Dalmer Laboratories and the Carlos Finlay Institute in Havana, scientists have developed several medications and immunizations through advanced techniques in biotechnology. Pharmaceutical products comprise Cuba's third most important export, behind sugar and nickel, and earn more than $100 million annually.[22]

One of these products, policosanol (PPG), is an oral medication derived from sugar cane that lowers cholesterol and atherogenic lipoproteins. Although Cuban scientists have published extensive laboratory and clinical trials evaluating the effectiveness and side effects of PPG, these publications have reached few US readers.[46-48] PPG has been approved for clinical use in the treatment of lipid disorders in Europe and Latin America because of its high benefit/risk ratio (the only side effect that occurs with notable frequency is heightened libido, which actually has enhanced sales in some countries).[45,49] The US Food and Drug Administration currently reports no evaluation of PPG for potential approval and release (Center for Drug Evaluation and Research, Food and Drug Administration, personal communication, 1996).

In 1981, Cuba started to produce interferon alfa. Initially, Cuban physicians used interferon as a treatment for serious viral infections, including Dengue fever and acute hemorrhagic conjunctivitis. Until wider production of interferon became possible during the late 1980s through recombinant DNA technology, Cuba and Finland were the leading producers internationally. More recently, Cuba has expanded the production of interferons, monoclonal antibodies, interleukins, and thrombolytic agents, for both export and internal use.[50] For instance, a Cuban monoclonal antibody has become a routine part of preventing rejection in the organ transplantation program. Streptokinase, produced in Cuba through recombinant DNA technology, has entered the initial treatment procedures for patients with acute myocardial infarctions.

Cuban biotechnology also has focused on the development and production of vaccines. During the 1980s, Cuba became a producer of all vaccines used in childhood, as well as hepatitis B vaccine. The Finlay Institute has produced an innovative vaccine against meningococcus strain B. This vaccine has proved to be useful in the prevention of meningococcal epidemics that have occurred in both developing and more economically advanced countries.[51,52] Cuba has exported the meningococcal vaccine to Latin American and European countries, which have used it for focused immunization campaigns.

Advanced surgical procedures. Transplantation surgery and supporting fields in internal medicine such as immunology and infectious diseases have emerged as major emphases of Cuban medicine. Since the late 1980s, Cuban physicians have performed virtually all types of contemporary transplantation surgery at a single national referral center, Hermanos Almeijeiras Hospital in Havana. This hospital routinely provides heart, heart-lung, kidney, pancreas, liver, cornea, and bone marrow transplants.[2(pp58-62)] Organs are harvested through a national computerized system based on histocompatibility testing and are transported by rapid air and

ground networks. A committee of health professionals at the Almeijeiras Hospital makes decisions about which of the patients who need transplants may receive them and in what order. Availability of organs appears more favorable than in some other countries because willingness to donate organs is assessed and recorded on the identification cards that all citizens carry; during recent years more than 90% of the population have indicated agreement to donate.

The clinical reputation of these transplantation services has led to heightened demand and referral of patients from many countries. In situations of shortage, Cuban patients receive priority for available organs. Although transplants are provided free to Cuban patients and to selected patients from outside Cuba, fees are charged to foreigners or to their public or private insurance programs when feasible. These fees help offset costs of equipment and supplies such as immunosuppressive agents, especially cyclosporin, which are difficult to obtain because of the US economic embargo. The Cuban bone marrow transplantation and hematology-oncology facilities have provided extensive humanitarian services, for instance, to more than 4,000 children from the former Soviet Union who developed leukemia after the Chernobyl nuclear accident.[2(p167)]

Other Cuban surgical procedures also have received wide attention.[2(pp186-195)] For instance, a surgical approach for the treatment of retinitis pigmentosa has attracted patients whom we interviewed from Europe, North America, and other Latin American countries. This technique has received international recognition, including the establishment of a foundation based in Argentina to provide funding for indigent patients. Similar advances and recognition have occurred in neurosurgery for the treatment of degenerative brain diseases and in orthopedic reconstructive surgery.

Controversy regarding high-technology programs. High-technology medicine in Cuba continues to generate controversy. As in the training of large numbers of physicians, the Cuban government's investment in expensive diagnostic and treatment procedures suggests that fewer economic resources become available for other needs within the society. Cuban health care leaders respond that such expenditures involve mainly up-front, planned investment in human resource development and equipment. Investments in biotechnology also enhance exports and foreign exchange.

The symbolic impact of these programs also figures prominently in policy decisions. From soon after the revolution, technologies equal to those of economically developed countries were made available, in addition to the extensive primary care and preventive services. Further, Cuba provided these technologies on a selected basis to people from other Third World countries and to assist those countries in the development of their own technologic capacities. This investment has led to increased legitimacy for the Cuban government, both inside and outside Cuba.[2(pp156-195)]

AIDS. AIDS policies in Cuba have evolved in unique and sometimes controversial directions. These policies have depended on close epidemiologic surveillance. In the most controversial of Cuba's policies, HIV-positive patients previously were temporarily separated from the general community during an educational and evaluational process in one of several national sanitariums.

Historically, the sanitarium policy originated in the mid-1980s, when several military officers returning from Africa were found to be infected with HIV. Although these officers were viewed as war heroes in Cuba, public health officials feared a rapidly increasing epidemic as other Cubans returned from Africa. Partly in keeping with a long tradition of treating patients with communicable infections in comfortable sanitariums, the government initially supervised the construction of an inpatient facility for HIV and AIDS patients near Havana. Because patients who tested positive for HIV were required to live there, the compulsory aspect of the policy received criticism from outside Cuba,[53,54] as well as praise for its apparent success in controlling the epidemic and its humane approach to patient care.[55-57] Homophobia, by our observations, did not influence HIV policies; for instance, one of the most widely known and highly respected Cuban advocates for HIV patients is the openly gay and HIV-positive family physician, Juan Carlos de la Concepción.

As the epidemic was brought under control and as more was learned about transmission, the compulsory components of Cuba's HIV policies were eased.[58] Residence at the HIV sanitariums has become voluntary for all except those who are unable to care for themselves and those who demonstrably have placed others at high risk through their conduct. Although sanitariums provide services in 13 of Cuba's 14 provinces, the proportion of HIV-positive patients

entering these facilities has declined, as more people have opted for outpatient treatment. A large majority of newly diagnosed patients, estimated at 70% to 80%, currently choose ambulatory treatment and do not enter a sanitarium. The patients whom we interviewed at the national sanitarium near Havana all expressed a preference to remain living there because they were able to maintain their family and work relationships while staying in close contact with the health professionals whom they trusted. These interviews showed a probable change in attitudes among HIV patients since 1993, when another US group studying AIDS in Cuba found more evidence of frustration with the restrictions imposed by prior sanitarium policies.[58]

Screening for HIV has occurred at a much higher rate than in other countries at comparable levels of economic development. In a population of somewhat more than 11 million, approximately 2 million tests are performed annually. Since 1987, mandatory testing has been done for specified groups: patients in whom other sexually transmitted diseases have been diagnosed and their partners, patients admitted to hospitals or undergoing outpatient surgery, pregnant women during the first trimester and at delivery, prisoners, public health employees, Cubans traveling abroad, workers in the tourism industry, and merchant sailors.[58] In addition, as patients obtain primary care services from family physicians, they receive encouragement to undergo voluntary testing.

Overall, Cuba's AIDS policies have achieved successful results, in comparison with both economically developed countries and other countries in the Third World. Until early 1996, the number of HIV-positive patients was 1199; 429 cases of AIDS had been diagnosed, with 287 deaths (Cuban Ministry of Public Health data, 1996). Although the Ministry of Public Health acknowledges that diagnoses have not been made in some HIV-positive patients, and has developed estimates of their numbers, the very extensive mandatory and voluntary screening programs indicate that the problem of underreporting is less severe than in other countries.

The technical level of AIDS services in Cuba equals or surpasses that in other countries. From our observations, Cuban physicians have succeeded in implementing all diagnostic and therapeutic procedures for HIV disease that currently are used in the United States. CD4 counts are monitored closely for all HIV-positive patients. Medications for treating the infectious and neoplastic complications of AIDS are usually available, despite difficulties due to the US embargo. The newest generations of antiviral agents enter clinical practice rapidly in Cuba, including, recently, the protease inhibitors. Additionally, care plans encourage the use of immunologically active materials that are readily available from Cuban producers. For instance, interferon alfa has been offered since the mid-1980s as a routine part of prophylaxis along with other immunizations. The leaders of Cuba's HIV program attribute the relatively low death rate among HIV patients partly to these additional features of AIDS prophylaxis. More systematic evaluation of these immunologically active medications in HIV care is a focus of current Cuban research.

We were struck by two paradoxes of HIV policies. First, as also noted by other observers,[5] condoms are relatively unavailable and are among the products solicited as donations from economically developed countries. Officials point to a cultural reluctance to use condoms, as well as the economic investment required to produce them in Cuba. On the other hand, public health educational campaigns emphasize the importance of condoms in preventing AIDS. In view of the major investments in high technology, the scarcity of this low-technology product is surprising.

Second, while a full discussion is beyond the scope of this article, the phenomenon of *jineterismo* deserves mention. Although prostitution drastically decreased after the revolution, it reportedly has reappeared recently in association with recent policies encouraging tourism to attract foreign capital. Actually, *jineterismo*— the sexually oriented activity that has increased, especially in tourist areas of Havana—differs fundamentally from traditional prostitution (*prostitución*), and the person who practices *jineterismo*, referred to as a *jinetera* if female or *jinetero* if male, differs markedly from the traditional prostitute (*prostituta*, or *puta*). The commonly understood connotation of *jinetera* in Cuba is related to the word *jinete*, which refers to an equestrian or a jockey in horse racing. The *jinetera/o* therefore takes on the symbolic connotation of a person in control over the person who chooses to accompany the *jinetera/o*.

Because *jineterismo* is impossible to miss in Havana, we tried to understand its meaning and health implications by talking informally and in a very preliminary way with several *jinateras/os* and

also with public health officials. It appears that most people who practice *jineterismo* work full time in other occupations or as students; sex work does not appear to be a major source of livelihood. For instance, one interviewee worked as a pharmacist and another as a law student. *Jineteras/os* receive all public services including health care, education, and housing assistance. The sexual dimension varies. While some *jineteras/os* exchange sex directly for dollars, many instead negotiate a social experience that includes dancing, eating, and drinking at one of the relatively expensive restaurants or bars that require dollars in payment. In these situations, the goals of *jineteras/os* apparently include entertainment and the opportunity to meet foreigners, rather than narrow economic goals. *Jineteras/os* are not permitted to enter tourist hotel rooms. In other public areas where *jineterismo* is practiced, police officers intermittently can be seen observing these activities, which appear neither illegal nor warranting specific sanctions.

Regarding HIV policy, *jineterismo* raises several issues. *Jineteras/os* appear knowledgeable about HIV. Ministry of Public Health officials point to programs that target education and voluntary screening of *jineteras/os*. These officials argue against repressive governmental intervention to deal with *jineterismo*. In view of Cuba's technical success so far in preventing the spread of HIV, the paradoxes of *jineterismo* warrant fuller attention.

CONCLUSIONS

Several features of Cuban medicine deserve further study and evaluation. Such innovations as family medicine residency training for all physicians, the government's investment in high-technology diagnostic and treatment procedures, epidemiologic surveillance, green medicine, and HIV policies all merit collaborative research, although restrictions on travel, publications, and telephone and electronic communication make this work cumbersome.

Aside from the US embargo's deleterious effects in Cuba, we became more aware of its adverse impacts for medicine in the United States. These negative effects derive in part from a lack of information, since Cuban publications often do not reach the United States and since Cuban professionals face difficulties in submitting articles to US journals or making presentations at professional meetings. Innovative Cuban medications, vaccines, surgical procedures, equipment, and computer software also cannot enter the United States.

The embargo apparently may exert some ironic positive effects in Cuba. Difficulties in obtaining petroleum products have motivated the importation of more than a million bicycles, which has markedly reduced traffic congestion and pollution and is probably improving the overall physical conditioning of the Cuban population. Similarly, the scarcity of red meat, according to Ministry of Public Health officials, has led to comparatively low rates of hyperlipidemia. Because of difficulty in importing third generation cephalosporins and quinolone antibiotics, Cuban hospitals have required the use of narrower spectrum agents; some Cuban physicians are researching the possibility that these measures may lead to lower rates of nosocomial infections.

From our observations, the embargo inhibits a detached, scientific appraisal of Cuba's accomplishments. The adverse impact of US policies on the free flow of information becomes especially ironic in light of US values supporting such freedoms. The United States has regularized diplomatic, trade, and travel relationships with other socialist countries such as China and Vietnam, as well as many dictatorial regimes. In our judgment, these considerations, together with the end of the Cold War, warrant a serious rethinking of US foreign policy toward Cuba. Otherwise, US medicine will continue to miss opportunities for scientific and clinical exchange that would benefit physicians and patients alike.

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