MEDICC Review

International Journal of Cuban Health & Medicine

January 2019

Vol 21, No 1

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***MEDICC Review* is indexed in:**

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Medical Education Cooperation with Cuba

MEDICC Review is published by MEDICC (Medical Education Cooperation with Cuba), a nonprofit organization founded in 1997 to enhance cooperation among the US, Cuban, and global health communities aimed at better health outcomes. The organization's mission is to support education and development of human resources in health committed to equitable access and quality care.

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MEDICC Review

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MEDICC Review (ISSN 1555-7960) is published quarterly by MEDICC (Medical Education Cooperation with Cuba) in January, April, July & October.

Submissions *MEDICC Review* publishes original peer-reviewed articles by Cuban and international authors. Send letters to editors@mediccreview.org. Guidelines for authors at www.mediccreview.org.

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2019: A Year of Challenges and Change

How to assess global health at the close of 2018 and project achievable goals for the new year? WHO began on a somber and urgent note by identifying Ten Threats to Global Health in 2019. They are: air pollution and climate change; noncommunicable diseases; global influenza pandemic; fragile and vulnerable settings; antimicrobial resistance; Ebola and other high-threat pathogens; weak primary health care; vaccine hesitancy, dengue and HIV. Cuba is vulnerable to many of these threats, but perhaps more importantly, it's already taking them on, proposing more intersectoral actions to address social determinants building upon the country's robust primary health care system.

Esquivel-Lauzurique's Perspective examines how Cuba's primary care network contributes to health outcomes for infants and children through the first two years of life, and analyzes the results according to the recommendations of the 1000 Days indicators. These indicators, developed by the Washington DC-based non-profit, 1000 Days, aim to promote optimal health and development through evidence-based interventions during pregnancy and early childhood.

In this issue we also reprint an article on the "team science" approach to child vaccine R&D by Dr Nivaldo Linares-Pérez, winner of Cuba's 2018 National Health Prize, the Ministry of Public Health's highest award. While the Pneumococcus Project is certainly not the only effort to use this approach for accelerated vaccine introduction, the experience provides insight into its application in one Cuban setting.

Cuba's health system has also been identified as one of the few offering universal coverage and access—*universal health*—a topic that for the first time will be the centerpiece of a High-Level Meeting during the UN General Assembly. In part two of our interview with Dr Cristian Morales, former PAHO/WHO Representative in Cuba, he discusses the commitment by the Americas' governments to universal health and proposes strategies for transforming the region's health systems to advance towards this goal. His comments are particularly timely now, when several countries in the Americas Region are suffering greater disparities in health and health care access. In addition, the interview offers a preview of the topic for ***MEDICC Review***'s special issue, planned to coincide with this important meeting. Its contents will examine concrete, programmatic contributions to universal health by Cuba's health system and its professionals.

Two articles in the current issue relate to WHO's top ten threats to world health: the first alludes to the significant strides Cuba has made in prevention, management and new treatments for diabetes—which as yet have not been duly reflected in national and international scientific publications. Corrales-Reyes' paper reminds us that workforce strength and public health achievements cannot be assumed to translate automatically into scientific dissemination. He notes that while many Cuban professors and specialists collaborate with other countries, especially in Latin America and Africa, neither have these partnerships yielded a comparable volume of scientific articles. Similarly (as pointed out in a previous Viewpoint), original research on Cuba's experience in primary care is scarcely presented in the peer-reviewed literature. In both cases, one possible contributor is the absence of formal training in scientific writing in the medical curriculum. To help address this training gap, in 2016 ***MEDICC Review*** (in conjunction with PAHO and Cuba's National School of Public Health) began offering annual writing courses, with participation by Cuban, US and European experts.

The second article referring to the WHO "top ten" is devoted to Cuba's top researcher in dengue and other arboviruses: virologist Dr Guadalupe Guzmán. She is highlighted as part of ***MEDICC Review's*** series Cuba's Women of Science. Among her many accomplishments, Dr Guzmán directs a biannual international course in dengue and arboviral diseases (the next one slated for August 2019). She also directs the WHO/PAHO Collaborating Center for Dengue and its Control and through last year was president of the Arbovirus Diagnosis Laboratory Network of the Americas (RELDA).

Dr Guzmán's work is ever more vital today, when tropical regions worldwide are experiencing a dramatic resurgence in dengue and other arboviral diseases, with more severe forms of dengue recently emerging globally. WHO reports a 30-fold worldwide increase in dengue over the past five decades. Cuba saw outbreaks in 2018 in the island's central and eastern regions. Dr Guzmán refers to innovations in dengue control and research, and to what she terms the all-important role social scientists are playing in arriving at new, more effective strategies to ensure community participation in dengue control efforts. She reminds readers that the same efforts applied to dengue prevention can also prevent Zika, chikungunya and even yellow fever.

For Cuba, 2019 marks a year of change, as citizens go to the polls on February 24th to vote on a proposed new version of its Constitution, a document that continues to assert, among other articles, the right to free, universal and public health care. At the same time, this year marks the celebration of the 500th anniversary of the Cuban capital, and Havana is expected to receive not only an unprecedented number of visitors but also significant investment, despite a tense economic situation.

At ***MEDICC Review***, we have two important changes to announce. We are pleased to welcome to our editorial team as Senior Editor, English Edition, Dr Elizabeth Vasile, a cultural geographer whose skills will help strengthen ***MEDICC Review's*** social science and qualitative research content. At the same time, we are saying farewell to Dr Christina Mills, nine-year veteran as Managing Editor, whose keen scientific judgment and teaching have benefitted us all. She has promised to continue to collaborate with the journal, which pleases us no end.

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All original articles appearing in MEDICC Review are subject to double-blind international peer review. *MEDICC Review* is indebted to the following colleagues for their collaboration as peer reviewers in 2018:

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We also thank Iván Cuevas-Valdespino MD MS MPH, epidemiologist, for his valuable review of research methodology in manuscripts submitted to *MEDICC Review* during 2018.

Confronting Arboviruses: María Guadalupe Guzmán MD PhD DrSc

Director, Reference Center for Research & Diagnosis Pedro Kourí Tropical Medicine Institute, Havana

Conner Gorry MA

The 1980s were a watershed for Cuban research in medicine and health: significant financing and material resources buttressed a strategy to improve population health through enhanced biopharmaceutical innovation and clinical best practices applied to Cuba's universal public health system. Redirecting research priorities and providing substantial public funding to tackle the top population health problems was a radical idea at the time, especially for a developing country like Cuba. Doing so has become a hallmark of Cuba's scientific achievements and approach ever since. Among the institutions exemplifying this strategy is the Pedro Kourí Tropical Medicine Institute (IPK). Founded in 1937 with a research mission dedicated to parasitology and transmission of known tropical diseases, it wasn't until the late Dr Gustavo Kourí Flores was appointed director in 1979 that IPK's core objectives and facilities were expanded to include a comprehensive teaching component, a state-of-the-art clinical hospital to treat tropical and other communicable diseases, and an international collaboration strategy to facilitate knowledge and technology transfer.

Today, IPK is Cuba's national reference center for diagnosis, treatment, control and prevention of communicable diseases and is a regional leader in applied research into so-called neglected diseases—usually diseases of the poor. With departments of parasitology, bacteriology, virology, pharmacology and more, it's a magnet for some of the country's most accomplished scientists—most of them women—and a major contributor to Cuba's portfolio of scientific products, research and publishing.

This interview with virologist Dr María Guadalupe Guzmán, director of IPK's Reference Center for Research and Diagnosis, is the third in *MEDICC Review*'s series on outstanding Cuban women in science and medicine. Recognized as a leading expert in dengue research, Dr Guzmán is also director of the WHO/PAHO Collaborating Center for Dengue and its Control and was president of the Arbovirus Diagnosis Laboratory Network of the Americas (RELDA) from 2010 through 2018. Currently, she is president of the Cuban Society of Microbiology and Parasitology, directs IPK's Scientific Council that sets the Institute's research priorities, and is a distinguished professor and author. In 2016, she published Dengue (Editorial Ciencias Médicas, Havana), the most comprehensive collection of original Cuban research available on the topic.

MEDICC Review: **The Institute was founded as a center for tropical disease research, but today has a much broader mandate. Can you explain what you and your colleagues do here?**

María Guadalupe Guzmán: When Dr Gustavo Kourí became director, he called IPK a sui generis institute—it's an institute that does research, but we do much more than just research. We have a clinical hospital and diagnostic laboratories; we conduct courses and seminars and so on. It's a necessarily complex structure because the work we do is complex.

Breaking it down, IPK is Cuba's national reference center for communicable diseases, divided into three centers: the hospital, which receives patients on an ambulatory and inpatient basis here at our Havana headquarters; the Surveillance Center, located in Jagüey Grande (Matanzas Province) for monitoring and treating quarantined patients during a disease outbreak; and the Center for Research and Diagnosis, where I work, alongside 230 other scientists and professionals. We have molecular biologists, parasitologists, virologists, epidemiologists, bacteriologists, geographers, mathematicians, immunologists, entomologists and medical doctors dedicated to scientific research, diagnosis and surveillance of all types of communicable diseases.

The Center also has a department of social research, which is extremely important, especially for vector-borne diseases like

dengue and Zika. Prevention and control of these diseases need community participation and collaboration, but how do you motivate people to practically support prevention efforts? How do we effectively inform and educate the public about possible threats and raise their awareness about control actions? Our social research department looks at all of these questions and analyzes how communities function, to encourage them to adopt lifestyles that better serve their health and the health of people around them. In my mind, this is a much more difficult area than traditional scientific research because you're dealing with individuals, families and communities.

MEDICC Review: **You mention dengue and Zika—two arboviruses along with chikungunya—that have ravaged the region in recent years. What are priority research areas for your Center on these diseases?**

María Guadalupe Guzmán: Dengue has a long history in Cuba. We experienced outbreaks of Dengue 1 in 1977–1978, Dengue 2 in 1981 and 1997 and of different strains afterwards, which is what most people remember. But dengue was in Cuba long before that. During the First War of Independence (1868–1878), Cuban troops fighting under Ignacio Agramonte against Spain referred to an illness they called "the white person's affliction," because white soldiers on both sides were much more likely to contract it than black soldiers. This medical–anthropological piece of data led one of our scientists to begin researching the genetic component of dengue epidemiology and resistance. This is an advanced, innovative project which holds promise for future prevention strategies.

Our interdisciplinary team of researchers is working on how people's movements influence the spread of dengue. Of course, international travel is a well-known factor in dengue transmission, but this research drills down to the neighborhood level. Based on the idea that people move, but the mosquito doesn't, if you have a person with dengue who lives in Marianao but works in Playa (two adjacent municipalities in Havana—Eds.), could we use this to predict where the disease might show up next? This research uses statistical projection models and identifies "hot spots"—areas where there is a concentration of cases and social determinants that might affect transmission. For example, standing water or uncollected garbage, improper household water storage, or high level of mobility amongst residents who live in a hotspot and work elsewhere might contribute to arbovirus infection rates.

A team of young entomologists is working on some intriguing larva research as well. In Cuba, we have a strong national surveillance network, as do several other countries, for patients who have already contracted dengue. But if we can identify disease-carrying mosquitoes at the larval stage, this will improve our projections and prevention.

For all our work it's important to use diagnostic algorithms to help forecast what we might face down the road. Obviously, you can't predict and control for every possibility, but the better prepared your diagnostic, prevention and control systems are, when unforeseen events *do* present themselves, you'll be better equipped to confront them. This is a strategy our entire institution follows, in coordination with the Ministry of Public Health and their priorities, and helped us when cases of Zika emerged, for example.

We're also working on a recombinant dengue vaccine in collaboration with the Genetic Engineering and Biotechnology Center (CIGB). This is in pre-clinical trials and is showing satisfactory results.

MEDICC Review: **You're a well-known dengue expert. In practical terms, how did Cuba's long experience with dengue contribute to the nation's response to Zika?**

María Guadalupe Guzmán: Cuba is a pioneer in standardized protocols and adheres to PAHO's Integrated Management Strategy for Arboviral Diseases, implemented in 2003. This requires systematizing everything related to prevention, control and response: vector control nationwide; laboratory diagnostics; surveillance technology; and case management. It also involves systematizing social aspects of prevention and diagnosis—our entire population participates in vector control, for example. Participation by our citizenry is one area in which we've improved thanks to the PAHO strategy.

It proved advantageous that these protocols were already in place when Zika and chikungunya appeared in Cuba. We were able to extend the protocols to these arboviruses that, like dengue, are transmitted by the *Aedes aegypti* mosquito. These are different diseases of course, but share some common denominators and from the point of view of surveillance and control, respond to the same strategy. This is also true for yellow fever, which we have to incorporate into our surveillance as well; we don't have yellow fever in Cuba but that doesn't mean that it can't occur here.

As director of the WHO/PAHO Collaborating Center for Dengue and its Control, I've worked intensively in Cuba's national network of diagnostic laboratories. To have effective prevention and control, you need standardized protocols and best practices in the labs responsible for the testing—this includes delivery and storage of reagents used in diagnosis, quality control of diagnostic kits and confirmation of results, as well as training of laboratory professionals. When Zika appeared, our experience with dengue allowed us to adapt the model to respond to this health threat. We established diagnostic laboratories according to WHO protocols and best practices for Zika in Santiago de Cuba (for the eastern region), Villa Clara (for the central region) and Havana (for the western region). As with dengue, all test samples are then transported to IPK for confirmation.

The objective of RELDA, the regional network of diagnostic laboratories, is to strengthen best practices and systematize and evaluate protocols in the Americas for prevention, control and surveillance of arboviruses. With communicable diseases like these, fragmented interventions and actions work against public health; everyone has to be on the same page and IPK's accumulated experience in the field has helped strengthen the quality and coordination of labs across the Americas region.

MEDICC Review: **We're talking about diseases that thus far predominate in poor countries—contexts where diagnostic best practices and protocols might be financially prohibitive or where there's little political will to implement them.**

María Guadalupe Guzmán: In some cases, a proper clinical exam can distinguish among dengue, chikungunya and Zika. But clinically, dengue has a very short cycle—from five to seven

days. If it develops into severe dengue, that means you have a very small window to save that patient's life. This, and the cost of testing every suspected case for each arbovirus, makes a strong argument for clear, concise clinical guidelines, predictive algorithms, and consistent, coordinated epidemiological surveillance and analysis for distinguishing among the different diseases.

In 2009, WHO issued new global guidelines for diagnosis, treatment, prevention and control of dengue. Cuba played a fundamental advisory role in drafting these guidelines following participation in DENCO (International Dengue Control Study; a multi-country prospective clinical study), a joint project between IPK, the European Union and other institutions. It shed light on how clinicians might more effectively diagnose and treat dengue. One major recommendation we and our international colleagues made was to establish clinical guidelines related to warning signs—symptoms that tip off a doctor that the patient may progress towards a more aggressive, and possibly fatal, form of dengue. Did your patient experience acute abdominal pain at the outset? Did they have persistent vomiting, experience fatigue or irritability, have bleeding from the mucous membranes? All of these serve as a kind of "dengue thermometer" for clinicians to identify those patients at risk of developing severe dengue.

There is no specific treatment for dengue. Rather, it's managed primarily by providing fluids, fluids, fluids!—juice, soup and of course water. The short cycle of dengue I mentioned, and the risk of some patients developing severe dengue, means early identification and intervention can save lives. I'm not a clinician, but in my opinion, the most valuable part of the new global guidelines are the recommendations related to clinical diagnosis. For years we've used clinical examination to look for warning signs, which in our experience can be life-saving.

Cuban experts worked closely with PAHO and other member countries when chikungunya and Zika emerged to draw up guidelines and informational materials to assist clinicians to distinguish among these three arboviruses—but of course, this is most effective when supported by a viable public health system, including a certified network of labs to confirm diagnoses.

MEDICC Review: **IPK is a WHO/PAHO Collaborating Center for Dengue and its Control and is active regionally and globally with other entities and organizations. Can you talk a little about these collaborations?**

María Guadalupe Guzmán: IPK has two WHO/PAHO collaborating centers: one for tuberculosis and the other for dengue. I head up the latter. We were first granted collaborating center status in 1996, when we were the reference center for virology. In 2005, we evolved into the reference center for dengue and were re-evaluated and certified. Every collaborating center has to adhere to protocols and best practices established at the global level by WHO. Maintaining this status requires a comprehensive WHO/PAHO evaluation every four years, and we've been recertified each time. In our case, we are evaluated according to guidelines related to clinical practices, emergency and vector response, and laboratories—including diagnostic and surveillance components.

We have ongoing collaborations with European institutions and are currently part of the Zika Alliance—an EU research project investigating Zika in pregnant women—and Zika Plan, another EU joint project evaluating diagnostic kits for this arbovirus. I'm also co-coordinator with Swiss colleagues of a project designed to strengthen and expand our diagnostic labs for Zika. And then there's the International Course on Dengue.

MEDICC Review: **In arbovirus circles, this IPK International Course is widely known. What does it entail?**

María Guadalupe Guzmán: A lot of work! After each course, I'm ready for a year's sabbatical—but that's one of the challenges of my work: lots to do and too little time. The International Course on Dengue, Zika and Other Emerging Arboviruses is a biennial event that IPK first hosted in 1987 with half a dozen students. I was one of them. This year will be our 16th edition, and of course enrollment has grown significantly.

The two-week course is divided into two modules, theoretical and practical. The course goal is to bring together leading experts and share the latest scientific, research and clinical developments related to dengue and other arboviruses—including vaccine development, clinical practices, social factors, diagnosis and prevention. We always have robust participation from Latin America and Europe and we've hosted African colleagues here too, though the prohibitive cost of international travel is a limitation. Despite the current US administration, which makes everything related to Cuba more challenging, we have many colleagues from the USA coming this year, including experts from the National Institutes of Health, Johns Hopkins Schools of Medicine and Public Health and University of California Berkeley, among others.

MEDICC Review: **Looking at the roster of international participants, it appears only 25% are women. Yet, one of the striking things about Cuban science, medicine, research and technology is the presence of women—as innovators, investigators and leaders. Can you comment on the role of women at IPK?**

María Guadalupe Guzmán: Most of the researchers, scientists and technicians at the Center for Research and Diagnosis are women—the hospital is more gender-balanced. But our Center attracts many graduates from the University of Havana's Biology Department where the majority of students are women. Parasitology, virology, bacteriology, epidemiology—we have women doing all kinds of innovative research in these fields here. Women also predominate in vaccine development and they are leading our research on malaria, a disease not present in Cuba but a major global health threat, nonetheless. And finally, our professors, who form the core of our education here, are mostly women.

My granddaughter celebrated her first birthday on Cuba's National Science Day, January 15th—so, at the rate we're going, who knows? Maybe she'll become one of Cuba's greatest scientists!

Cuba and the Global Year of Universal Health: Cristian Morales PhD

Former PAHO/WHO Representative in Cuba

Gail A. Reed MS

A 2014 PAHO resolution that Cristian Morales helped formulate serves as a framework for the Americas' governments to actively work towards health for all their people, incorporating this aim into national programs for sustainable development. This September, the UN General Assembly will sponsor a High-Level Meeting on Universal Health . . . a first in its history. In part two of ***MEDICC Review***'s interview with Dr Morales, he outlines strategies he believes vital for transforming health systems to reach universal health—defined as coverage and access for all—and for turning words into action.

MEDICC Review: **The 2019 UN meeting comes on the heels of the 40th anniversary of the Alma Ata Declaration, which committed the world's governments to health for all. What are your expectations of the meeting and Cuba's possible contribution?**

Cristian Morales: Alma Ata was a milestone in global public health, consolidating primary health care as fundamental, not only to achieve health for all but also to ensure the right to health the world over. For various reasons, Alma Ata's goals weren't fulfilled, falling short of its slogan *Health for All by the Year 2000.* Many important advances were made in the 80s and 90s, expanding health services for those who had gone without. But many times, these were limited to "basic packages" of care for the poor. And as the founder of the British health system said: policies for the poor are poor policies. That is, policies must leave no one behind and address the needs of the most vulnerable, but they have to be intended for everyone, universal. And this is the essence of Alma Ata that we're trying to recover 40 years later, that universal health be our guide for moving forward over the next decades. This is the vision that will enable us to implement the right to health and build health systems that fight inequities, are more efficient and express solidarity.

But now we face the huge challenge of going beyond words. Declarations are important as frameworks representing political consensus. But when you're faced with the reality of changing priorities—because we're also saying that health must have a higher priority—this can often clash with other interests. In any case, the idea is to find ways to implement the essential elements of Alma Ata in the workings of our health systems over the next decades, leading to more efficiency, improved health and wellbeing, and also more equitable and productive societies capable of generating more economic growth. And we have to be very clear on this: health is integral to economic growth, key to decent employment and to developing the potential of entire populations. You also have to recall that the majority of people working in health are women and in general these jobs are better than those in some other sectors, so prioritizing health also helps us struggle against gender-based inequities.

I believe the Alma Ata anniversary allows us to project a consensus for the 2019 UN General Assembly, leading to high-level commitment by countries to placing health at the core of sustainable development as we move towards the year 2030. It gives us the chance to revitalize what we already know is needed: first and foremost a focus on health preservation and promotion. But we shouldn't stop there. We have to be capable of providing curative care at the primary and other levels, as well as palliative care and rehabilitation as needed, in other words integrated services. And these must be provided through an organizational structure inserted in communities that can include hospitals but isn't solely concentrated there.

***MEDICC Review*: This change in the model of care—from hospital centered to people, family and community centered—was one of the four key strategies you outlined in our earlier conversation as essential to paving the way towards universal health. And the other three?**

Cristian Morales: I should also note that this first strategy coincides with transformations in Cuba's own health system

over time. The second strategy I would identify is health system governance: in most countries in our region, health systems are fragmented, meaning patients have to go to specific places for specialized care and continuum of care is broken. For example, if I have both diabetes and hypertension, I'll probably need to see two different specialists—specialists who rarely even talk to one another.

Care is also segmented by job and socioeconomic status. If I don't have the resources of the person next to me, we're going to be seen in different facilities, in different subsystems with different resources available to us. And that generates avoidable inequalities, what we term inequities.

Structuring consolidated governance that guides actors in the same direction with clear objectives—which lead to improved health and wellbeing, with fewer disparities in health and thus fewer inequities in the society at large—is a second requisite for promoting universal health. In Cuba, we see strong governance through the Ministry of Public Health, so we don't find the problems of fragmentation and segmentation we see in other countries.

The third strategy is the responsibility of the state for health. This has to do primarily with health financing. It's important to understand it this way because health systems often include a myriad of providers, both public and private (whether profit-making or nonprofit such as those offered by some NGOs). We have to attract and work with all those who provide health services, realizing at the same time that the gaps are enormous in services and their quality.

So when we talk about the state's responsibility, we're first referring to its responsibility to ensure that all these systems and providers use the same protocols, act according to the same strategies, have the same standards. But also, and this leads us to the third strategy, that financing should come mainly from public funds. This is very explicit: it requires that the region's countries should spend public funds on health equivalent to at least 6% of the country's GDP. The reality is that very few countries in our region meet this goal: Cuba (which spends over 6%), Canada, Costa Rica and one or two more.

The average is only 3.8%, so when we are aiming at 6%, this implies a significant shift in priorities for state spending. But it's quite necessary, since what we've witnessed empirically in the most developed (OECD) countries is that they may be capitalist, but they have socialized their health systems, mainly aiming at greater efficiency in use of resources but also stemming from a long-term commitment to their societies' development.

These OECD countries spend an average of 8% of GDP on public funding for health. So if we return to the 6% goal in our region, it's clear that this change would put us within reach of universal health. Why do I think so? Because it's not about undoing what's been done, but rather transforming what exists. And that is much easier when you have more resources. This doesn't mean taking away resources from one place to give to another: it means injecting more resources into health systems in order to respond to population health needs, but also to contribute towards liberating human potential that in turn drives development of the economy and society as a whole.

In essence, this is a win –win investment. And such an investment is backed by the experience of other countries' advances along this path.

MEDICC Review: **So, where to begin this transformation towards universal health?**

Cristian Morales: To begin such a process of transformation, which is bound to be different in each country, it might make sense to start by adopting one or another of the strategies first. But eventually, they have to dovetail, guided by a uniting vision. And that leads us to the fourth strategy: intersectoral action, because of course health doesn't depend on health systems alone.

In fact, studies show that social and environmental determinants carry more weight than health systems when it comes to population health results. This includes, for example, the interaction between health and education, health and agriculture, health and efforts to control vectors responsible for Zika and other viruses as well as to decrease antibiotic resistance. Early education to teach healthy habits in school children will serve population health throughout their generation. Intersectoral action with the economy can lead to healthier populations, with a social climate more conducive to ventures that generate better ideas and in which people are more productive and take more initiative. Another example is the environment, where through greater intersectoral action, the effects of climate change can be mitigated, protecting people from the risks it poses.

Taken together, these four strategies—a people-centered model of care, strong governance, public funding at least 6% of GDP and greater intersectoral action related to social and environmental determinants—coincide with the reality of Cuba's health system, and of others as well. Yet, this is not a goal to be pursued by one country or even a group of countries: I believe our whole region of the Americas can advance towards universal health.

MEDICC Review: **In relation to what health systems need to be strong, to be able to meet the needs of their people, how do you see the changes in Cuba over the years?**

Cristian Morales: Health systems rely on a few essential elements to consolidate and offer quality services, promote health and prevent disease. First of course, they need human resources, and there is no doubt that Cuba has these as a result of a decision taken very early in the process of establishing a single public health system, a visionary decision. And that visionary decision was followed by another: creation of the health research institutes and during the very difficult economic situation in the 1990s, investments in the biopharmaceutical industry, biotechnology.

So, in addition to human resources, you need the kind of technology that comes from these institutions' accumulated knowledge transformed into medicines, new molecules, new procedures and equipment.

And of course you need financial resources as part of the equation, and also infrastructure. When, for various reasons, you have limited access to funding—as is the case in Cuba—then it's very important to be able to bring in the hard currency

to buy raw materials, for example, to produce the medications needed in the country. (Two thirds of the medications on Cuba's essential medicines list are produced domestically.) No matter the facilities and human resources that exist in Cuba to maintain this production, certain raw materials and active ingredients have to be bought abroad in hard currency. And add to that the third of medications that must be imported, including some of the latest, quite expensive technologies that Cuba doesn't yet produce that help prolong lives and improve quality of life. Making these technologies available is a responsibility that the health system has assumed, despite the cost.

***MEDICC Review*: Let's talk a bit more about Cuban biotech. It's been in the news because of the Cuban lung cancer therapeutic vaccine now in clinical trials in the USA by virtue of agreements with the Roswell Park Comprehensive Cancer Center in New York. And the number of novel products emerging from Cuba's biotech industry is surprising, given the size of the country. How do you see biotech's role in Cuba and internationally?**

Cristian Morales: Biotech in general has been one of the great drivers for improving quality of life and extending life expectancy. The rhythm of transformative discoveries in health technologies is truly impressive, and in many countries this has created a paradox: even when these discoveries are made available to health systems, they are not always available to the people who need them.

The fact is that the biotech industry in most of the world is structured mainly to reap economic benefits. What's interesting in Cuba's case is that we see a high-quality industry with novel, innovative products like the lung cancer vaccine CIMAvax-EGF, others such as Heberprot-P for treating diabetic foot ulcers, and many more. The difference is that here we have an interconnected industry that from the moment research is initiated to produce new knowledge, forethought has already been given to how to transform that knowledge into technology, and how to integrate both into the entire health system. So that's another important experience Cuba has to offer, which also includes strict protocols for product validation through clinical trials.

Cuba's biotech industry's first mission is to place all its products and technologies at the service of the national health system. But at the same time, its products are marketed globally, benefiting the health of millions while generating revenues vital to sustaining a universal public health system like Cuba's.

***MEDICC Review:* Whatever the advances, all health systems face challenges. What are the main ones you see in Cuba?**

Cristian Morales: In Cuba's case, I think the first big challenge is to maintain its achievements and plan strategies to reach higher in the coming years. This is clearly recognized by the country's health leaders when they affirm, for example, the need to further improve mortality indicators in maternal-child health. One of the goals of the Ministry of Public Health is to reduce infant mortality to under 4 per 1000 live births, not an easy task.

Another great challenge for a health system like Cuba's is to make more efficient use of resources to guarantee its sustainability. They have already resolved efficiency at the macro level in two ways—first by having a single health system, which is more efficient than a fragmented one with different subsystems. This allows for more integrated, comprehensive patient care, including prevention. The second, which we've already mentioned, is that they provide public financing for the system.

However, many other sources of efficiency still have to be considered that can be improved in any system, including Cuba's. These have to do with planning and with purchase and distribution of inputs, resources, medications and so on. Reducing waste is another challenge for every health system: sometimes waste results from errors, other times it's due to loss of medicines because of occasional supply disruption, and of course like everywhere else, there are issues of corruption. No country is exempt from that.

So, several sources of efficiency can still be tapped to guarantee the health system's sustainability. If you look at the structure and organization of services: this is still guided by the public health law of 1983, when the social, economic, epidemiologic and demographic situation in Cuba was substantially different than today. Currently, Cuba's is one of the world's most rapidly aging populations: over 20% of its people are 60 years or older. This automatically presents quite a different epidemiologic picture, in which noncommunicable chronic diseases are the main causes of death and morbidity, and are also combined with old and new communicable disease threats (the old ones like dengue, which has been in Cuba for some years, and new ones such as Zika, chikungunya and other latent viruses).

This challenge, then, is related to some outdated assumptions in the health system's legal framework, a challenge that if met can also produce greater efficiency in terms of better organization of patient services today. And finally, there's the challenge, at least in my view, of continuing Cuba's tradition of solidarity.

MEDICC Review: **Does PAHO/WHO play a role in addressing these challenges?**

Cristian Morales: Yes, I think so. As we analyzed these challenges, we conceived a strategy of "accompaniment", agreed upon with the Ministry of Public Health, around five main priorities. The first is *more health*, that is collaboration to help achieve better health outcomes; then comes *more efficiency*, followed by *more intersectoral action* (related to the sustainable development goals and explicitly how other sectors can promote health), *more resiliency* (such as mitigation of the effects of climate change), and finally *more Cuba in global health.*

These are the priorities that will guide our cooperation through 2022, expressed in an agreement signed in April 2018 at the CubaSalud Convention, where we had the privilege of signing the document with the WHO Director General, PAHO Director and Cuba's Minister of Public Health. (See https://apps.who.int/iris/bitstream/handle/10665/275329/ccs-cub-2018-2022-spa.pdf?ua=1—Eds.)

I think that PAHO and WHO can contribute a great deal to Cuba and other countries. I think our main goal right now is to help countries implement universal health and to facilitate collaboration among them.

MEDICC Review: **In this year when the goal of universal health is once again on the global agenda, from your experience, what do you see as Cuba's contribution to these debates? What does Cuba have to offer, even in dialogue with countries that don't share its social or economic system?**

Cristian Morales: I think Cuba's most important contribution is proving that it can be done…universal health. Cuba has shown that even with few resources, if there is determination, you can achieve health results beyond what might be expected of a small, resource-limited country facing a difficult geopolitical context. It's been complex for Cuba since its revolution. But despite this, they've done more than many countries with greater resources, and not only in health outcomes and quality of life for the Cuban population. They have managed to build bridges between people, between countries.

Cuban Youth Promote Healthier Diet through Art

Conner Gorry MA

Art, education, health and nutrition: encouraging healthy eating at an early age is central to the World Food Programme's (WFP) goals. To this end, using art as a learning and communications tool, the program sponsors WFP in Action, a drawing contest open to youngsters 5–18 years old. Cuba has participated in the contest nationally since the 1990s, and since 2002 has sent a selection of drawings annually to the international competition at WFP headquarters in Rome.

In the 2018 edition of the contest, international judges received 5 drawings from each of 20 participating countries. Applying criteria of esthetic appeal, originality and artistic quality, they awarded 20 prizes. Four of the five drawings from Cuba were among the international prize winners. The WFP reproduces prize-winning images in calendars, t-shirts, and other materials to promote their programs and raise funds towards ending world hunger and child malnutrition.

WFP began its collaboration with Cuba in 1963, providing emergency relief after Hurricane Flora devastated the island's eastern provinces. Today, WFP programs in Cuba aim to boost food and nutritional security among the country's most vulnerable populations, strengthen the food supply chain with an emphasis on high-protein beans (a Cuban dietary staple) and consolidate community resiliency and responsiveness in disaster risk management.

MEDICC Review is pleased to reproduce this year's four winning drawings by Cuban children—each of whom hails from a different province.

See drawings in full color at www.mediccreview.org

The Vitamin Machine. Leandro Martínez Mirabal, 11 years, Consolación del Sur (Pinar del Río Province)

We'll Feed the Whole School with this Carrot

Yenifer Vilarino Sintes, 10 years,
Rafael Freyre (Holguín Province)

Untitled

Leonardo Pérez Santana, 9 years,
Quemado de Güines (Villa Clara Province)

We'll Study Better with Proper Nutrition

Daniela Díaz Carmona, 11 years
(Camagüey Province)

16th International Course on Dengue, Zika and other Emerging Arboviruses

August 12–23 ,2019

Pedro Kourí
Tropical Medicine Institute
Havana, Cuba

Languages
Spanish, English

Information
María G. Guzmán MD PhD, lupe@ipk.sld.cu

Topics

- Global and regional situation, international in initiatives
- Integrated Management Strategy for Arboviral Diseases (including surveillance and vector management)
- Clinical picture and pathology (case definitions. differential diagnosis. clinical management)
- Genome and viral structure, replication and viral evolution (flavivirus, alphavirus)
- Zika in pregnant women
- Zika sexual transmission
- Neurological disorders associated with dengue, Zika and chikungunya
- Chronic chikungunya: What do we know?
- Serological and molecular diagnostics (challenges for laboratory surveillance of arboviruses)
- Immune response
- Host genetic factors and severity of dengue and Zika
- Pathogenesis (role of immune enhancement in dengue and Zika)
- Flavivirus NS1 protein
- Advances in vaccines and antivirals
- *Aedes aegypti* ecology, vector competence
- Vector dynamics in arbovirus transmission
- Vector control (chemical and biological methods, new tools and strategies)
- Sterile insect technique (experiences in the Americas Region)
- Mechanisms of insecticide resistance
- Virus–mosquito interaction
- Social and community aspects of arbovirus transmission and control
- Ecobiosocial approach to arbovirus control and prevention
- Health economics and control of diseases transmitted by *Aedes aegypti*
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Registration

instituciones.sld.cu/ipk/files/2018/08/Registro-de-Participantes-English.pdf

Cuban Scientific Production on Diabetes, 2000–2017: Peer-reviewed Publications, Collaboration and Impact

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ABSTRACT

INTRODUCTION The steadily increasing prevalence of diabetes globally has captured researchers' attention. Cuban production of scientific articles on diabetes has not been studied from a bibliometric perspective.

OBJECTIVE Characterize the production and impact of research and review articles on diabetes by Cuban authors in journals listed in the Scopus bibliographic database, as well as related collaboration among Cuban institutions and between Cuban and non-Cuban institutions.

METHODS A bibliometric analysis was conducted using 2000–2017 data from the Scopus database. The following search strategy was used: descriptor (diabetes), country (Cuba), publication source (journal), article type (original research, review article). Bibliographic indicators of production, visibility, impact and collaboration were examined.

RESULTS Cuba contributed 3.2% of Latin American production and 0.1% of global production related to diabetes. Within Cuba's scientific production (610 articles, 538 original research and 72 review), 85.9% had a Cuban corresponding author (Cuban leadership). In articles with international collaboration (22.9%), however, most (67.9%) had non-Cuban corresponding authors. A total of 47% (287) were articles involving a single institution. Only 11.1% were published in top-ranked journals, and 14.4% were cited >10 times. Cubans were lead authors on 0.3% of the most frequently cited (top 10%) articles on diabetes in Scopus. A total of 38.4% of this production appeared in low-impact journals and 57.9% in Cuban journals.

Articles published in English accounted for 30% of total and obtained higher impact in terms of citations than articles in Spanish. The strongest networks for scientific collaboration were those that connected Cuban and US researchers.

CONCLUSIONS Cuban scientists conduct research on diabetes, but their work is not highly visible in the peer-reviewed literature, particularly in top-ranked journals. The problem is not simply one of publishing more, but of knowing how and where to publish. It is urgent that Cuban universities training health professionals at all levels include instruction on scientific writing.

KEYWORDS Diabetes, health services research, scientific journals, bibliometrics, Cuba

INTRODUCTION

The term diabetes includes type 1 and type 2 diabetes mellitus (DM) (the most common), maturity onset diabetes of the young (of which seven types have been described), diabetes related to cystic fibrosis, medication-induced diabetes and gestational diabetes.[1] Due to its high mortality and morbidity, DM is a global public health problem of unquestionable importance.[2–4] It is characterized by insulin deficiency or resistance, or a combination of both.[5,6] Type 1 DM is a chronic autoimmune disease that primarily affects children and adolescents.[6,7] Type 2 DM is characterized by high blood sugar that can develop asymptomatically.[6] In general, independent of its classification, DM can cause chronic vascular damage, which produces many severe complications.[8]

According to the International Diabetes Federation, 451 million people worldwide aged 18–99 years suffered from diabetes in 2017 (and in some countries, as many as 1 in 2 diabetics is likely to be undiagnosed), the number expected to increase to 693 million by 2045.[9] The average prevalence of DM in South and Central America is 8%, with wide variations among and within countries.[10–15] In Cuba, prevalence was 6.2% of the total population (5.1% among men and 7.2% among women) in 2017. That same year, 2425 people died as a direct consequence of DM.[15]

IMPORTANCE This article is a wakeup call that one of the most important chronic conditions in Cuba, and Cuban strategies for addressing it, are not sufficiently reflected in the international literature.

Increases in diabetes morbidity, mortality and costs to individuals and health systems[10] demonstrate the need for research on this topic. Bibliometric analysis of publications on diabetes is useful in assessing the current state of research and contributions of researchers and countries, and can be a resource for those who lead research within a working group, an institution or a country.[16]

Bibliometric analysis of diabetes-specific scientific production has been carried out at the global level,[16–21] as well as for the Middle East, Iran, Nigeria, Argentina, Thailand, India, China, Brazil and Peru.[22–31] However, our literature review found no bibliometric studies of Cuban scientific production on diabetes.

This study aims to characterize production of original research and review articles on diabetes published by Cuban authors in journals included in the Scopus bibliographic database, and related collaboration among Cuban institutions and between Cuban and non-Cuban institutions.

METHODS

Design A bibliometric analysis was conducted using 2000–2017 data from the Scopus database.

Bibliometric indicators The following indicators were studied:

- number of articles with at least one author affiliated with a Cuban institution
- total number of citations received by articles
- total number of articles cited at least once
- mean number of citations for all articles retrieved
- percentage of articles involving collaboration
- type of collaboration—
  - none (article entirely produced within a single Cuban institution, regardless of number of authors or departments involved)
  - national (author affiliations include more than one Cuban institution)
  - international (author affiliations include institutions in at least one other country besides Cuba)
  - national and international (author affiliations include institutions from more than one Cuban institution and at least one other country)
- h-index. This considers both number of articles and number of citations. An author's h-index equals *x* if they have *x* articles cited at least *x* times.[32] May be applied to groups of authors, departments or countries, as well as individuals.
- growth rate (GR): percent change in number of articles published in a domain with respect to previous year, calculated as: $GR_n = [(Ndoc_n - Ndoc_{n-1})/Ndoc_{n-1}] * 100$, where *n* is the year[33]
- top ranked journals: in top 25% (Q1) of journals when ranked in descending order per SCImago Journal & Country Rank (SJR)[34]
- language of publication: Spanish, English, both
- scientific excellence: inclusion in 10% most frequently cited articles on diabetes indexed in Scopus[35]
- Cuban scientific leadership: corresponding author affiliated with Cuban institution[36]
- excellence with leadership: percentage of articles led (corresponding author) among 10% most-cited articles on diabetes indexed in Scopus[37]
- percentage of articles in Q1 journals where corresponding author is affiliated with a Cuban institution
- Cuban leadership: percentage of articles where author affiliations contain addresses in more than one country, and corresponding author is affiliated with a Cuban institution
- percentage of articles with Cuban corresponding author signed by authors in more than one Cuban institution and at least one in a non-Cuban institution

Data retrieval and processing On August 21, 2018, an advanced search was conducted in Scopus using filters by country (Cuba), journal type, article type (original research and review) and year of publication. The search term was "diabetes." The search strategy is displayed in Table 1. For data processing and analysis, records were exported to an ad hoc database using bibliographic reference management software (EndNote X7).

Articles in the 10% most cited articles on diabetes were obtained using Scival, a bibliographic analysis system from Elsevier. Using the same filters as previously described, Latin American scientific production was obtained for Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, Uruguay and Venezuela. The SJR platform was used to categorize journal ranking by quartile. A bibliometric map of scientific cooperation networks among countries was created with VOSviewer v.1.6.5 software,[38] using the full-counting method.[39] Such maps display nodes representing collaborating countries and links connecting these nodes, with link width representing collaboration intensity determined by number of articles.

Table 1: Search strategy for articles on diabetes

Operator	Field	Search term
	AFFILCOUNTRY	Cuba
AND	SRCTYPE	j
AND	TITLE-ABS-KEY	diabetes
AND	PUBYEAR	≥1999
AND	LIMIT-T0	DOCTYPE, "ar" OR DOCTYPE, "re"
AND	EXCLUDE	PUBYEAR, 2018

RESULTS

Production and citation of original research and review articles The Scopus database included 610 articles (538 original research and 72 review articles) with at least 1 Cuban author over the 18-year period under study, with an annual average of 33.9. Annual number of publications grew through 2010, with 2017 production tripled that of 2000. Citations rose to 6243, for an annual average of 346.8. A total of 60% (366) of articles were cited at least once. The h-index overall for the study period was 34 (Table 2).

Type of article, language of publication and citations Articles in Spanish constituted 67.2% (410) and received 605 citations (1.5 per article), with an h-index of 8. Articles in English (183, 30%) were mostly (119, 65%) published in the final years of the period (2010–2017) and received 5610 citations, with an h-index of 34. The mean number of citations per article was 30.7. As of 2006, the database included publications appearing in both languages, representing 2.5% of the total (15), with 24 citations and an h-index of 5 (Table 2).

Original research articles The 538 original research articles received 5724 citations, with an average of 10.6 per article and an h-index of 32. A total of 201 original research articles received 1–5 citations; 40 received 6–10; 77 received >10; and the remaining 220 (40.9%) were not cited. In other words, 78.3% of articles received few or no citations. There were 370 (68.8%) articles published in Spanish, 153 (28.4%) in English and 13 (2.4%) in Spanish and English. A single article was published in Portuguese, receiving four citations. Another was published in English and Croatian and was not cited.

Among articles published in Spanish, 159 received 1–5 citations; 12 received 6–10; 5 received >10; and the remaining 194 (52.4%) were not not cited. Of articles published in English, 35 received 1–5 citations; 27 received 6–10; 72 received >10; and the remaining 19 (12.4%) were not cited. In summary, 95.4% of original research articles published in Spanish received few or no citations. The percentage of original research articles published in English and rarely or never cited was 35.3%.

Review articles The 72 review articles received 519 citations with an average of 7.2 per article, and an h-index of 9; 29 articles received 1–5 citations; 8 received 6–10 citations; 11 received >10 citations; and the remaining 24 (33%) were not cited. There

Table 2: Bibliometric indicators of Cuban scientific articles on diabetes (Scopus, 2000–2017)

Year	Articles n	Citations n	Articles cited n (%)	Spanish articles (CPA)	English articles (CPA)	English and Spanish	h-Index	Excellent[a] %	Cuban led[b] %	In Q1 journals %
2000	14	52	8 (57.1)	13 (1.9)	1 (27)	0	4	0.0	100	0.0
2001	21	153	15 (71.4)	18 (2.3)	3 (37.0)	0	5	0.0	100	4.8
2002	29	145	24 (82.8)	25 (2.8)	4 (18.6)	0	8	0.0	100	3.5
2003	9	1088[c]	7 (77.8)	5 (1.6)	4 (270.0)	0	5	11.1	77.8	22.2
2004	22	83	15 (68.2)	15 (1.9)	7 (7.7)	0	6	0.0	66.7	22.7
2005	20	702	16 (80.0)	8 (10.4)	12 (51.6)	0	11	10.0	85.0	25.0
2006	33	707	15 (45.4)	26 (0.7)	6 (114.8)	1	6	6.1	81.8	12.1
2007	30	280	18 (60.0)	23 (2.0)	7 (33.4)	0	7	3.3	80.0	3.3
2008	34	620	24 (70.6)	25 (1.6)	9 (64.6)	0	7	5.9	85.3	11.8
2009	40	491	27 (67.5)	29 (1.8)	11 (39.8)	0	8	5.0	77.5	7.5
2010	45	188	28 (62.2)	33 (1.1)	8 (18.4)	4	6	0.0	95.6	6.7
2011	38[d]	246	23 (60.5)	25 (1.7)	12 (16.7)	0	7	0.0	89.5	10.5
2012	50	159	30 (60.0)	36 (1.2)	12 (9.7)	2	6	0.0	90.0	8.0
2013	55	328	39 (70.9)	29 (1.3)	24 (12.0)	2	9	0.0	81.8	16.4
2014	43[d]	300	30 (69.8)	22 (1.0)	17 (5.9)	3	10	0.0	81.4	14.0
2015	49	335	22 (44.9)	33 (0.5)	16 (19.9)	0	5	2.0	83.7	6.1
2016	35	324	13 (37.1)	18 (0.1)	15 (21.5)	2	6	2.9	80.0	22.9
2017	43	42	12 (27.9)	27 (0.1)	15 (2.6)	1	4	0.0	88.4	11.3
Overall	610[d]	6243	366 (60.0)	410 (1.5)	183 (30.0)	15	34	2.0	85.9	11.1

[a]among 10% most frequently cited articles for topic [b]Cuban corresponding author
[c]A US clinical trial on hypertension with keyword "diabetes" accounts for spike in citations [d]articles in other languages not included in horizontal totals
CPA: citations per article

were 35 (48.6%) articles published in Spanish, 30 (41.7%) in English and 2 (2.8%) in both languages. Of articles published in Spanish, 14 received 1–5 citations; 3 received 6–10; and the remaining 18 (51.1%) were not cited. Of articles published in English, 11 received 1–5 citations; 5 received 6–10; 11 received >10; and 3 (10%) were not cited. A total of 91.4% of review articles in Spanish received no or very few citations, as did 46.7% of those published in English.

Scientific collaboration, excellence and leadership Scientific collaboration was analyzed with regard to production volume and article impact, expressed by number of citations (Table 2). Nearly half (287, 47%) of Cuba's scientific production on diabetes was from a single Cuban institution (i.e., without any external collaboration); these articles received 540 citations (8.6% of total). A total of 183 (30%) articles were published in collaborations involving authors from several Cuban institutions, most (116, 63.4%) in the final 8 years under study (2010–2017). Work conducted and published with international collaboration accounted for 22.3% of the total; 52.2% of articles had both Cuban and international collaboration; and 25.5% were produced by a single Cuban institution.

A total of 85.9% of articles named a Cuban as corresponding author. Cubans were corresponding authors in 32.1% (45/140) of articles published with international participation. Two articles (0.3%) deemed excellent (top 10% in citation frequency) had Cuban leadership; they were published in 2005 and 2015 (Table 2). The 94 articles published by a single Cuban institution in collaboration with non-Cuban institutions represented 15.4% of the total but received 64.8% of citations (4046). A total of 77.7% of these articles had a non-Cuban corresponding author. Works published by more than one Cuban institution and with international collaboration (46, 7.5%) received 12.6% of all citations; of these, 47.8% had a non-Cuban corresponding author (Table 3).

Cuban contributions to international production, rates of increase, h-index and publications in top-ranked journals The volume of global production on diabetes in Scopus during the period studied amounted to 457,681 articles. Scientific production from Latin America during the period totaled 19,268 articles, for an annual average of 1070.4. Cuba was responsible for 3.2% of Latin American and 0.1% of global production. Within Latin America, Cuba ranked 6th in number of articles published over the full period, surpassed by Brazil (9850, 51.1%), Mexico (3822, 19.8%), Argentina (1760, 9.1%), Chile (1235, 6.4%) and Colombia (745, 3.9%). Cuba ranked fifth in 2000–2008, and also in 2010. In 2008, Cuba shared the 5th-rank position with Colombia (34 articles). In 2009, Cuba was displaced from fifth to sixth by Colombia and stayed in that position in 2011–2015, and in 2017. In 2016, Cuba ranked seventh, after Peru. In terms of h-index values during the years studied, in Latin America, Cuba ranked 8th, along with Peru (h = 34), and behind Brazil (h = 159), Mexico (h = 116), Argentina (h = 98), Chile (h = 77), Colombia (h = 63), Venezuela (h = 39) and Puerto Rico (h = 38).

Over the 18 years covered by the study, global scientific production on diabetes increased steadily (with the exception of 2017), with an average annual growth rate of 8.3%. Annual production increased from 10,278 articles in 2000 to 38,238 in 2017. In Latin America, the 240 articles published in 2000 increased to 2019 by the year 2017, an average annual growth rate of 14.2%, which is much higher than the global average. In contrast to Latin America, where annual growth rates never dipped into negative values, in Cuba, the years 2000, 2003, 2005, 2007, 2011, 2014 and 2016 had negative growth rates (Figure 1).

Table 3: Articles by type of scientific collaboration and impact in citations (Scopus, 2000–2017)

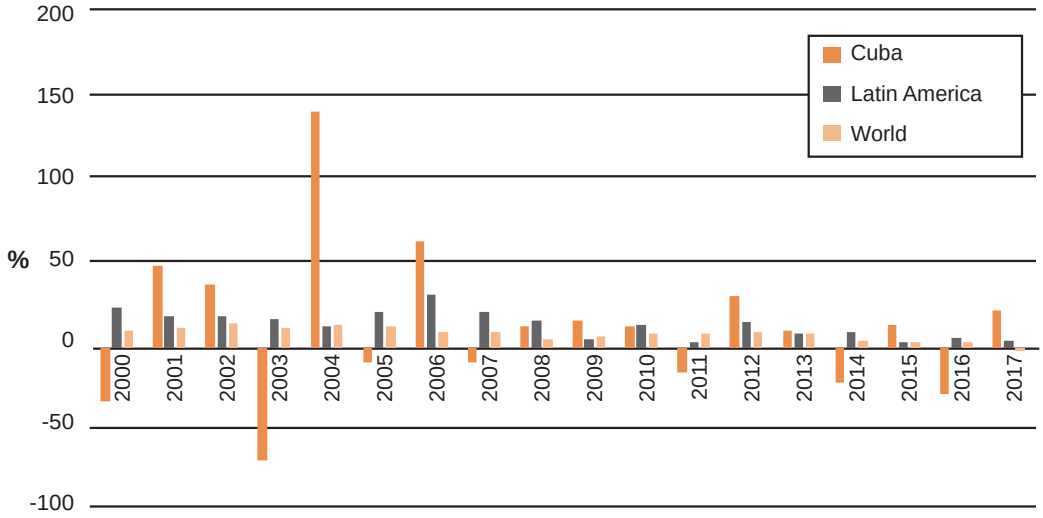
Year	No collaboration		National collaboration		International collaboration			International and national collaboration			Cuban led International and national + international*
	Articles n	Citations n	Articles n	Citations n	Articles n	Citations n	Cuban led* %	Articles n	Citations n	Cuban led* %	
2000	11	24	3	28	0	—	—	0	—	—	—
2001	16	81	4	11	0	—	—	1	61	100	100
2002	19	69	8	60	2	16	100	0	—	—	0.0
2003	4	8	2	22	2	1014	0.0	1	44	100	33.3
2004	8	17	6	26	8	40	12.5	0	—	—	12.5
2005	6	17	6	157	5	285	60.0	3	243	100	75.0
2006	21	17	5	40	6	635	0.0	1	15	100	14.3
2007	13	31	10	125	6	123	16.7	1	1	0.00	14.3
2008	19	25	8	41	5	456	20.0	2	98	50.0	28.6
2009	15	37	15	85	9	362	11.1	1	7	100	20.0
2010	26	28	15	58	2	101	0.0	2	1	100	50.0
2011	21	52	10	74	3	98	33.3	4	22	50.0	42.9
2012	17	17	24	41	7	54	42.9	2	47	50.0	44.4
2013	24	86	16	58	11	159	27.3	4	25	50.0	33.3
2014	15	18	13	26	8	127	37.5	7	129	42.9	40.0
2015	23	7	11	6	7	263	28.6	8	59	25.0	26.7
2016	12	0	10	11	10	304	20.0	3	9	33.3	23.1
2017	17	6	17	1	3	9	33.3	6	26	50.0	40.0
Overall	287	540	183	870	94	4046	22.3	46	787	52.2	32.1

*Cuban corresponding author

Some 11.1% (68) of Cuban-authored articles on diabetes were published in Q1 journals, 45 of them in 2009–2017 (Table 3). These articles received 4143 citations, representing 66.3% of all citations, for an average of 60.9 citations per article and an h-index of 26. All were published in English and 22 (32.4% of Cuban-authored articles in Q1) had a Cuban corresponding author. A total of 12.5% (76) of all articles were published in Q2 journals. These received 1104 citations, accounting for 17.7% of the total, with an average of 14.5 citations per article and an h-index of 19; 98.7% (75) of them were published in English. Some 232 (38%) were published in Q3 journals and received 642 citations, accounting for 10.3% of total citations, with an average of 2.8 citations per article and an h-index of 13. Of these, 20 articles (8.6%) were published in English. The remaining 234 articles (38.4%) were published in Q4 journals and received 354 citations (5.7% of all citations received), with an h-index of 7. Language of publication was English for 17 of these articles (7.3%).

Cuban authors were published in 174 journals, 12 of which published ≥10 articles on diabetes (1 in Q2, 6 in Q3, and 5 in Q4). Cuban journals accounted for 353 articles (57.9%), of which 170 were cited (414 citations) at least once. Articles published in Cuban journals received 6.6% of citations—more than half (183) were not cited—with an h-index of 8. The greatest volume of production (158) was found in *Revista Cubana de Medicina General Integral, Revista Cubana de Investigaciones Biomédicas* and *Revista Cubana de Medicina,* together accounting for 25.9% of all articles. Corresponding authors were Cuban for all articles in the 12 journals that published ≥10 research articles (Table 4).

Figure 1: Annual growth of global, Latin American and Cuban scientific production on diabetes (Scopus, 2000–2017)



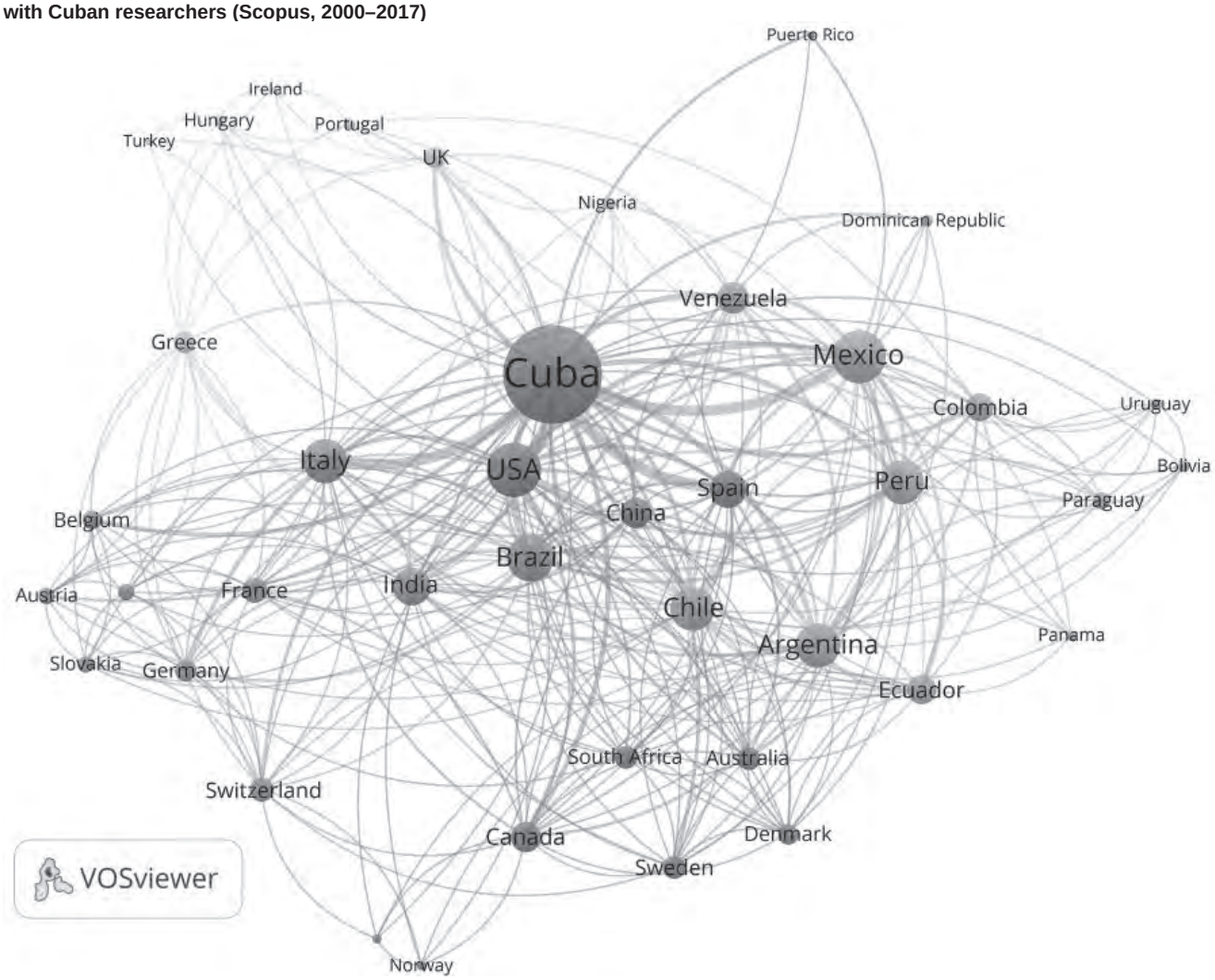
With regard to impact (in terms of citations) of articles in journals with ≥10 articles published, *MEDICC Review* was the journal with the greatest number of citations and highest h-index (346, 11.2 citations per article and h = 10) and the only non-Cuban journal with ≥10 articles retrieved. The highest percentage of scientific

Table 4: Journals publishing ≥10 Cuban-authored articles on diabetes (Scopus, 2000–2017)

Journal	Country	Quartile[a]	Articles n	Citations n	Articles cited n (%)	CPA	H-index	Collaboration[b] %	Cuban led[c] %
Revista Cubana de Medicina General Integral	Cuba	Q3	57	81	34 (59.7)	1.4	4	35.1	98.3
Revista Cubana de Investigaciones Biomédicas	Cuba	Q4	51	80	32 (62.7)	1.6	4	39.2	98.0
Revista Cubana de Medicina	Cuba	Q4	50	38	19 (38.0)	0.8	3	26.0	100
MEDICC Review	USA	Q2	31	346	25 (80.7)	11.2	10	71.0	90.3
Revista Habanera de Ciencias Médicas	Cuba	Q3	31	22	11 (35.5)	0.7	3	29.0	100
Revista Cubana de Medicina Militar	Cuba	Q3	30	19	9 (30.0)	0.6	3	10.0	100
Revista Cubana de Obstetricia y Ginecología	Cuba	Q3	26	30	13 (50.0)	1.2	3	38.5	100
Biotecnología Aplicada	Cuba	Q4	16	47	11 (68.8)	2.9	4	68.8	100
Revista Cubana de Salud Pública	Cuba	Q3	16	15	9 (56.2)	0.9	2	62.5	100
Revista Cubana de Cirugía	Cuba	Q4	14	5	4 (28.6)	0.4	1	14.3	100
Revista Cubana de Higiene y Epidemiología	Cuba	Q4	12	24	8 (66.7)	2.0	3	58.3	100
Revista Cubana de Pediatría	Cuba	Q3	10	20	4 (20.0)	2.0	3	70.0	100

[a]SCImago Journal & Country Rank[34] [b]manuscript produced in collaboration of any sort [c]Cuban corresponding author CPA: citations per article

Figure 2: Scientific collaboration networks among countries with ≥3 articles published with Cuban researchers (Scopus, 2000–2017)



(available in color online at www.mediccreview.org/cuban-scientific-production-on-diabetes-2000-2017)

collaboration of any type was found in *MEDICC Review* (71%), followed by the *Revista Cubana de Pediatría* (70%) (Table 4).

Production of articles deemed excellent was scant. In 10 of the 18 years under study, none was reported (Table 2). Works deemed excellent appeared in the following journals: *American Journal of Epidemiology, American Journal of Medicine, American Journal of Obstetrics and Gynecology, BMC Complementary and Alternative Medicine, Circulation Research, Journal of the American Medical Association, Journal of Physiology, The Lancet, Gastroenterology,* and *European Journal of Pharmacology.* Articles in the latter two journals had a Cuban corresponding author (excellence with Cuban leadership).

Collaboration networks Cuban authors published with researchers from 34 countries, most frequently the USA (36 articles), Spain (26), Italy (24), Mexico (24), Brazil (13), Argentina (10), and Peru (9). Figure 2 presents a bibliometric map of scientific collaboration networks among countries, with a threshold of three or more coauthored articles published. The diagram shows a central nucleus of densely connected countries surrounded by countries with fewer connections. The countries fall into five clusters. Cuba, USA, Spain, Italy and Mexico are the main nodes, with the greatest number of coauthored articles. The most prolific networks of scientific collaboration exist between Cuban and US researchers.

DISCUSSION

Critical analysis is key to interpreting bibliometric indicators. For example, the figures for Cuban leadership are redundant for articles entirely authored by Cubans but are of great interest when analyzing articles with international collaboration. Combined analysis of number of citations by publication language that simultaneously takes into account journal quartile and international collaboration is much more informative than the overall numbers yielded by the search. The study initially detected 115 articles published in Spanish and English. After critical examination, this number was reduced to 15. The overrepresentation was due to the fact that articles with abstracts in two languages were included in the database. The atypical number of citations in 2003 reflects a Cuban-authored article with keyword "diabetes" with content unrelated to the search topic—It was actually about a clinical trial on hypertension.

Production of Cuban articles in the medical sciences is lower than might be expected given the country's human capital and research capabilities and contains scarcely any articles from the primary health sector, the foundation of Cuba's universal health system.[40,41] For Benet, this poses cause for concern, as the residency in family medicine (the specialty of the majority of new medical graduates) requires a thesis.[42] Master's and doctoral degrees also require scientific publication. Given the 18-year period under analysis and the high number of Cuban health sciences students and professionals (totaling 192,596 in the 2017–2018 academic year, according to the 2017 Health Statistics Yearbook),[15] one could expect high productivity in terms of articles published in indexed scientific journals.

This study demonstrates shortcomings in Cuban medical publishing on diabetes in terms of visibility and impact. For scientific production on diabetes to reflect Cuban outcomes in prevention, diagnostics and treatment, Cuban researchers would need to publish in journals with greater visibility. For example, in years with the greatest number of publications on this topic, h-indexes were very low. Limited publication in Q1 journals is observed in other branches of Cuban science and is not specific to the health sciences.[33,40,41] The scientific literature does not yet adequately reflect the Cuban health system's strategies, research, product development or outcomes.

Cuban researchers and administrators are far from demonstrating the results of their daily work and research in top-ranked scientific publications.[43] It has been noted that low production of scientific articles might be influenced by the absence of a culture of publication, insufficient training in scientific writing, and the (understandable) existence of other priorities, such as teaching and patient care, which account for the greatest share of professional responsibilities and time.[41] We agree with Zacca-González, who notes the need for strategies to promote publication in top-ranked journals while seeking a balance between articles published in Cuban journals and those published in non-Cuban journals.[44]

Over the period, Cuban scientific production showed a tendency to stagnate, in contrast to global trends[16–21,27,29,45–47] and those of countries such as Nigeria,[26] China[30] and Peru.[31] The number of articles retrieved from Scopus increased when Cuban journals from SciELO were included, but the total number of citations decreased, as did the h-index.[44,48] Cuba ranks sixth in Latin America in number of articles published, which is impressive when taking into account the size of our population and the US embargo. But Cuba's position in term of its h-index is less satisfactory, and its eighth-place position in Latin America is difficult to explain.

We believe Cuban journals should redouble their efforts to recruit high-level international peer reviewers. External peer review by international experts can contribute substantially to article quality and is a free source of instruction and scientific debate that allows us to assess our research quality by international standards.

Authors from Cuba published as coauthors with researchers from 34 countries, with the USA leading the list. In recent decades, there has been a notable increase in scientific collaboration,[49] influenced by multidisciplinary and increasingly specialized research. This brings additional benefits in terms of citations and impact.[50] Among the obvious benefits of international collaboration is the possibility of participating in international research, with its access and contributions to the collective knowledge of key experts, state-of-the-art treatments and technologies, and ongoing research programs.[51]

As noted in other studies,[52,53] articles published with international collaboration achieved, on average, greater impact in terms of citations than those produced with only Cuban or no collaboration. The likely reasons for this are the increased number of informal and formal channels for dissemination, publication in the top-ranked journals, superior research quality (in some cases), or the importance beyond local horizons of its subject matter—factors of greater interest to the international scientific community. Narin found that publications by scientists affiliated with institutions connected to more than one country in the European Union were cited twice as often as articles written by scientists working in a single institution within a single country.

Narin concludes that national collaboration increases the volume of citations by a factor of 1.5, whereas international collaboration increases it by a factor of 2.5.[54] The extraterritorial nature of the US economic, financial and trade embargo in effect since 1962 has been an obstacle not only to greater bilateral research collaboration and publishing but has also limited contact with other countries' researchers.[55]

Cuban leadership in articles published with international collaboration was found to be low, perhaps because these are international research projects generated and led by non-Cuban entities. Involvement with international institutions in research areas led by Cuban entities strengthens our national capacity, particularly in activities involving training for human resources and the acquisition of technology.[56–58]

Many Cuban professors and specialists do collaborative medical work in other countries, especially in Latin America and Africa, but this extensive collaboration has not been translated into the production of scientific articles in this field.[48] Cuba is home to the Latin American School of Medicine, which to date has trained some 30,000 health professionals from around the world. These professionals could be a valuable source of publishable experiences, in collaboration with Cuban specialists or entities. It would make sense to include scientific writing and publishing in its curriculum, and to encourage students to undertake research projects linked to medical practice in their communities. We agree with Zacca-González,[44,48] who believes that conditions exist to create collaborative networks and achieve greater impact and visibility for Cuban scientific research.

Study limitations Samples obtained in this study might include articles without diabetes as a main topic, despite having the term "diabetes" in their descriptors. A more restrictive strategy, such as searching in indexed journals under the thematic category "Endocrinology, Diabetes and Metabolism" in the Scopus database, would have meant ignoring a great amount of diabetes research published in multidisciplinary journals or found in other thematic categories. Nor did the study characterize the main themes of scientific research on diabetes in Cuba. This could be the topic of future studies.

CONCLUSIONS

The volume of publications on diabetes by Cuban authors illustrates that diabetes motivates research by Cuban scientists and institutions but their work is insufficiently reflected in the peer-reviewed literature, particularly top-ranked journals. We urgently need to change this situation. The current problem is not simply one of publishing more, but of knowing how and where to publish. It is urgent that Cuban universities training professionals at all levels of health care include instruction on writing for publication in peer-reviewed journals.

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Submitted: December 8, 2017
Approved for publication: December 15, 2018
Disclosures: None

Cuban Experience with Lung Ultrasound to Diagnose and Classify Pleural Effusion in Critically Ill Patients

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ABSTRACT

Pleural effusion is a common condition in critically ill patients (both clinical and surgical). Its diagnosis and classification are important for followup of patients with cardiorespiratory difficulty. Lung ultrasound is used for this purpose, but no reports have been published on its use in Cuba with critically ill patients in intensive care units. We performed lung ultrasound on 144 such patients with cardiorespiratory illnesses, average age 54 years, predominantly men (66%; 95/144), with average APACHE II score 13.6, and 22.1% mortality risk. Patients were divided into two groups: clinical (bronchopneumonia and cardiac insufficiency) and surgical (postoperative liver and kidney transplant or vascular and cardiovascular surgery) to diagnose and classify pleural effusion according to locus (right, left and bilateral) and structural pattern (I, II A, II B, III and IV). Pleural effusions were diagnosed in 81.2% (117/144) of patients (clinical 44.4%, 52/117; surgical 55.6%, 65/117). Bilateral location was the most common (68.4%, 80/117), followed by right (23.9%, 28/117) and then left (7.7%, 9/117). Structural pattern I (anechoic appearance) was observed in 61.5% of cases (72/117); 21.4% (25/117) were II A, 12.8% (15/117) II B, 3.4% (4/117) III, and 0.9% (1/117) were IV. We found no association between pleural effusion localization and ultrasound structural pattern in clinical patients (Fisher exact test 4.2 p = 0.9). In surgical patients, however, complex ultrasound patterns (II A, II B and III) were significantly more common in bilateral forms (Fisher exact test 14.1; p = 0.009). Further studies of this type in Cuba will help provide useful data for prompt treatment and followup of these patients.

KEYWORDS Pleural effusion, critical illness, intensive care unit, lung ultrasound, diagnostic ultrasound, Cuba

INTRODUCTION

Pleural effusion (PE) is a common illness in intensive care units (ICUs). Critically ill patients develop PE as an outcome of a primary disease or as a side effect of treatment and life-support measures.[1] PE diagnosis in critically ill patients traditionally has been based on simple anteroposterior x-rays.[2] Lung ultrasound (LU) has several advantages over this method: it takes less time, is reproducible in real time, and can be repeated as necessary. In critically ill patients, it provides better sensitivity and reliability for PE diagnosis.[3]

LU can also be performed at bedside, important since transporting ICU patients to a radiology department poses high risk of complications and adverse events. Acute hemodynamic and respiratory complications may occur in 40%–50% of patients with severe respiratory difficulty during transfer.[3] In trauma patients, a baseline CT scan performed within 12 hours of admission to ICU informs a change in clinical management in less than 30% of cases but exposes patients to transfer-related risks. The potentially hazardous effects of exposure to radiation or a contrast medium associated with these procedures should also be considered.[3]

Since the 1967 publication of Joyner's study describing the reflected ultrasound technique to diagnose PE, major advances have been made in such imaging technology and professional training for its use.[4] These have led to clinical practice guidelines on LU use for PE diagnosis and treatment.[5]

IMPORTANCE This article presents the results of Cuba's first report on use of lung ultrasound in diagnosis and classification of pleural effusion in critically ill patients in intensive care units.

International evidence-based recommendations indicate that point-of-care LU is more accurate in PE detection than supine radiology and as accurate as CT.[6] Chest x-rays can detect PE in upright patients only when effusion volume is >200 mL; this method's sensitivity decreases in the supine position, while ultrasound may detect an effusion as small as 20 mL.[7,8] Moreover, ultrasound can detect the morphology and locus of pleural effusion and other associated conditions (such as atelectasis and diaphragmatic disorders). Baseline LU is recommended before thoracentesis, in order to reduce complications.[9]

Cuba's first published reference to LU use was authored by a pediatrician in 1987.[10] Several Cuban ICUs have used LU, including the ICU in Cuba's Medical-Surgical Research Center (CIMEQ), which began applying the procedure seven years ago. However, no studies have been published in Cuba on the application of LU to diagnosis and classification of PE in ICU patients.

INTERVENTION

Objective Diagnose and classify PE in critically ill patients in a Cuban ICU using LU.

Justification PE diagnosis and classification is quite important to determine appropriate procedures to manage critically ill patients in ICUs. Use of LU serves this goal, with the advantage that it can be performed at bedside, is more portable than CT and MRI, and has the sensitivity features described previously.[3,7,8]

Participants Study participants were patients (n = 144) hospitalized in CIMEQ's multipurpose ICU in Havana between January 2012 and September 2017, aged >18 years (average 54, SD 16), predominantly men (66%, 95/144). All patients were classified by their Acute Physiology and Chronic Health Evaluation (APACHE II) score,[11] which enables evaluation and confirmation of severity and provides an estimate of an individual's mortality risk; in some cases it may be a criterion for ICU admission. Average APACHE

II score was 13.6 (SD 7.6) and corresponding mortality risk was 22.1% (SD 20.3). We classified patients in two groups—clinical (69/144) and surgical (75/144)—according to diagnosis upon ICU admission. Clinical patients presented with illnesses requiring cardiorespiratory monitoring (bronchopneumonia and cardiac insufficiency); surgical patients were in post-operative phase of complex procedures (liver and kidney transplants, vascular and cardiovascular surgeries) who did not present malignancies.

PE variables

- Presence or absence
- Location (right, left, or bilateral)
- Appearance (per Tu classification)[12]
  - I: Anechoic: no echogenic density within the effusion;
  - II A: Complex nonseptated and relative hyperechoic: predominant hyperechoic spots visible in the effusion, and echogenic shape that does not change with respiration
  - II B: Complex nonseptated and relatively nonhyperechoic: some visible bright spots as echogenic density within the effusion and echogenic shape that changes with respiration
  - III: Complex septated: prominent fibrinous septation visible within the effusion;
  - IV: Homogeneously echogenic: density of echogenic spots evenly distributed within the effusion

Lung ultrasound LU assessments were conducted with ProSound Alpha 5 SV equipment (Aloka, Japan), using a flat or concave 3−5 MHz transducer and a 5−7 MHz flat transducer when needed.

LU is performed with the ICU patient prone. Each hemithorax is divided into four areas and each of these into two zones—anterior and lateral—separated by the anterior axial line. Each zone, in turn, is divided into superior and inferior according to a horizontal line between the middle and lower thirds of the sternum. Diagnosis is performed through the application of transducers directly on the chest. PE is seen as an echo-free space (dark anechoic image) between the parietal and visceral pleurae, with other specific imaging signs.

The ultrasound image of a pleural effusion shows loss of pleural movement. When etiology is infectious, hyperechoic structures are visible in the effusion's interior or adhered to the pleura; presence of septation indicates chronic conditions. An effusion's extent can be estimated in several ways, but qualitative characteristics are always more useful for determining prognosis.[13,14]

Data collection and analysis We set up an Excel database and performed data analysis with SPSS version 20. Absolute and relative frequencies were used. We used the Fisher exact test for analysis of associations involving patient type, PE locus, and ultrasound pattern (significance threshold p = 0.05).

Ethics Patients or their relatives (in the case of unconscious or sedated patients) received explanation of the study's objectives, risks and benefits, and written informed consent was obtained. The study was approved by CIMEQ's ethics committee.

RESULTS

PE was diagnosed in 81.2% of patients (117/144). Approximately 55.6% (65/117) of PE cases occurred in surgical patients and 44.4% (52/117) in clinical patients. Bilateral effusions were most common at 68.4% (80/117) followed by effusions on the right (23.9%, 28/117) and left side (7.7%, 9/117) (Table 1).

PE ultrasound patterns showed decreasing frequency from simplest to most complex. Pattern I was observed in 61.5% of cases (72/117), pattern II A in 21.4% (25/117) and pattern II B in 12.8% (15/117). The septated pattern III was observed in 3.4% (4/117) and pattern IV in a single patient for 0.9% (1/177) (Table 1).

In clinical patients, no association was found between PE location and ultrasound pattern (Fisher exact test 4.28, p = 0.96). In surgical patients, however, we found an association (Fisher exact test of 14.16, p = 0.011) between bilateral localization and more complex ultrasound patterns (II A, II B and III).

LESSONS LEARNED

Compared to other studies, ours found higher frequency of PE diagnosed via LU. One study in a US ICU reported 62% (62/100) [15] and another in an Egyptian multipurpose ICU reported 60% (78/130) in patients with pleuropulmonary disorders.[16] Results of a German study carried out in a surgical ICU were similar to ours, as PE was diagnosed in 73% of cases (35/48).[17] Our study was conducted in a multipurpose ICU where patients with complex surgeries receive postoperative care. To maintain proper

Table 1: Relation between ultrasound pattern and pleural effusion localization (n = 117)

Type of patient	Type of pleural effusion	Pleural effusion localization			Total
		Right	Left	Bilateral	
		n (%)	n (%)	n (%)	n (%)
Clinical [a]	I	6 (66.7)	4 (80.0)	24 (63.2)	34 (65.4)
	II A	2 (22.2)	1 (20.0)	10 (26.3)	13 (25.0)
	II B	1 (11.1)	0 (0.0)	2 (5.3)	3 (5.8)
	III	0 (0.0)	0 (0.0)	1 (2.6)	1 (1.9)
	IV	0 (0.0)	0 (0.0)	1 (2.6)	1 (1.9)
	Total	9 (100.0)	5 (100.0)	38 (100.0)	52 (100.0)
Surgical [b]	I	17 (89.5)	1 (25.0)	20 (47.6)	38 (58.5)
	II A	2 (10.5)	2 (50.0)	8 (19.0)	12 (18.5)
	II B	0 (0.0)	1 (25.0)	11 (26.2)	12 (18.5)
	III	0 (0.0)	0 (0.0)	3 (7.1)	3 (4.6)
	Total	19 (100.0)	4 (100.0)	42 (100.0[c])	65 (100.0)[c]
Total	I	23 (82.1)	5 (55.6)	44 (55.0)	72 (61.5)
	II A	4 (14.3)	3 (33.3)	18 (22.5)	25 (21.4)
	II B	1 (3.6)	1 (11.1)	13 (16.3)	15 (12.8)
	III	0 (0.0)	0 (0.0)	4 (5.0)	4 (3.4)
	IV	0 (0.0)	0 (0.0)	1 (1.2)	1 (0.9)
	Total	28 (23.9)	9 (7.7)	80 (68.4)	117 (100.0)

I: Anechoic pattern: no echogenic density within the effusion
II A: Complex nonseptated and relatively hyperechoic pattern: predominant hyperechoic spots visible in the effusion, and the echogenic shape not changed with respiration
II B: Complex nonseptated and relatively nonhyperechoic pattern; some visible bright spots as echogenic density within the effusion and the echogenic shape changed with respiration
III: Complex septated pattern: prominent fibrinous septation visible within the effusion
IV: Homogeneously echogenic pattern: echogenic spots density evenly distributed within the effusion
[a]Fisher exact test 4.28, p = 0.96
[b]Fisher exact test 14.16, p = 0.011
[c]rounding error

hemodynamic status during surgery, large volumes of liquid are administered intravenously. This necessary overhydration may increase circulating volume and cause increased pleural capillary pressure with a decrease in reabsorption, thereby producing PE.[18] Most PE patients in our study were in the surgical group. From these observations, we infer that PE is a common disorder in ICUs, especially in surgical patients.

Unlike results reported by other authors, where the right hemithorax was the most common locus of PE, our study found the bilateral most prevalent. In a Cuban internal medicine clinic, Pérez Bada found that 63.6% (35/55) of cases presented on the right side, 23.6% (13/55) on the left, and 12.7% (7/55) bilaterally.[19] In pediatric clinics in Cuba's Sancti Spíritus Province, right pleural effusion was the most common with 66.7% (10/15).[20] Although these were not ICU patients, we mention these findings here as the only comparisons available for Cuba. A study in Nigeria found PE in the right hemithorax in 50.2% (107/213) of cases, in the left in 42.7% (91/213), and bilaterally in 5.6% (12/213).[21] In a hepatic hydrothorax study in Madrid, the right side also predominated (85.4%).[22] In Tu's study, right localization was most common with 39.4% (37/94), followed by left with 30.8% (29/94), then bilateral with 29.8% (28/94).[12]

PE location varies and depends on the site of the original disease causing PE (viral or bacterial pneumonia, pulmonary thromboembolism, tumor), and may be localized in either the left or right hemithorax or both.[1,2] The main cause of bilateral PE is congestive heart failure. Other causes are liver diseases, severe kidney failure, hypoalbuminemia and fluid overload.[23,24] All these conditions occur more frequently in ICUs, mainly those receiving patients directly out of surgery. The predominance of bilateral PE in our study can be explained by the high proportion of surgical patients. Bilateral PE is the most common in critically ill patients with diseases requiring cardiorespiratory monitoring (bronchopneumonia and cardiac insufficiency) or following major surgery (liver or kidney transplants, vascular or cardiovascular surgeries).

There are several ultrasound classifications of pleural effusion. Some use two categories (simple or complex)[25] and others, including our study, define pleural effusion's imaging characteristics in greater detail.[12] We found anechoic patterns to be more common than hyperechoic patterns, with a distribution from lesser to greater morphological complexity. Tu's work—the main reference for our study—presented these results: pattern I: 39.8% (47/118), II A: 30.5% (36/118), II B: 1.7% (2/118), III: 9.3% (11/118), and IV: 1.7% (2/118).[12] Our study was similar in that it showed predominantly anechoic patterns (I and II A) and differed in the frequency of cases with septated patterns (II B, III, and IV).

Other studies have also observed a predominantly anechoic pattern. Chen,[26] for example, reported anechoic in 44.9% (57/127) and a complex nonseptated pattern in 55.1% (70/127), with no complex septated or homogeneously echogenic patterns. Similar to our study, Lomas reported that 60% (54/90) presented anechoic appearance; the remaining patients (40%, 36/90) presented with diffuse internal echoes with internally septated primary loculation, and others showed no distinction between solid and liquid ultrasound features in the pleural space.[27]

Echogenic PEs ranged from lesser to greater structural complexity with a smaller proportion of patients presenting the most complex (II B, III and IV) patterns. With respect to the association between PE locus and classification according to ultrasound pattern, our results suggest that the bilateral pleural effusions of surgical patients present more complex ultrasound patterns (not seen in clinical patients).

The literature review did not reveal a relationship between patient type and localization or morphology of their PEs, with the exception of Tu's study.[12] Differences between Tu's findings and our study may be partly due to Tu's subjects consisting of febrile ICU patients. In Tu, cases complicated with empyema presented the following distribution: 66.7% (10/15) ultrasound patterns II B and IV, none with patterns I and II A, and 33.3% (5/15) pattern III. PE localized on the right hemithorax was the most common with 53.3% (8/15), followed by bilateral with 26.6% (4/15), and lastly on the left with 20% (3/15).[12] Tu's study shows that in severe diseases of the pleura (empyema), complex structural patterns predominated.

Our study concurs with Tu[12] in finding that lung disease severity affects complex ultrasound patterns. We also observed association in surgical patients between incidence of bilateral PE and more complex structural patterns detected by LU.

Although results from a single ICU and a relatively small sample cannot be generalized, these are the first findings describing diagnosis and classification of PE with LU in a Cuban ICU context and thus serve as a reference point for further research.

This application of LU in Cuba confirms what has been learned elsewhere, that it is feasible in any appropriately equipped ICU. Compared to other imaging techniques, the procedure is simple and inexpensive, and personnel can be easily trained. We recommend study replication in other Cuban hospitals to obtain additional data useful for timely training and patient followup.

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Submitted: October 3, 2018
Approved for publication: January 15, 2019
Disclosures: None

Comprehensive Care for Cuban Children in the First 1000 Days of Life

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ABSTRACT

The first 1000 days of life constitute a short and exceptionally important period when the foundation is established for children's growth, development and lifelong health. Cuba has a comprehensive care system for this population that aims to promote the best start in life so that children can reach their highest development potential. This is carried out through the national public health and education systems and also includes elements of health protection, prevention of harm and disease and social welfare for children.

Cuba's infant mortality rate has remained <5 deaths per 1000 live births for 10 consecutive years, and in 2017 reached 4 per 1000, the lowest rate to date. The mortality rate for children aged <5 years in 2017 was 5.5 per 1000 live births, with a survival rate of 99.5%; low birth weight was 5.1% and vaccination coverage >95%. Among children aged 1 year in Cuba's Educate Your Child program in 2014, >90% met age-specific indicators in all four developmental domains (intellectual, motor, socioaffective and language). Cuba has universal coverage for antenatal care and, in 2017, 99.9% of births occurred in health institutions. All working mothers receive paid antenatal leave from 34 weeks of gestation, continued through the child's first year, to facilitate breastfeeding and child care. In 2018, the Cuban government allocated 27% of its national budget to health and social welfare and 21% to education.

KEYWORDS Growth and development, child development, child health services, preventive health services, primary health care, pregnant women, children, child rearing, intersectoral collaboration, Cuba

INTRODUCTION

The first 1000 days of life, from conception through two years old, constitute a short and exceptionally important period in which the foundation is laid for children's growth, development and lifelong health. Recent evidence confirms, as described in *The Lancet* 2016 series on early childhood development, that harmful exposures cause the greatest damage and interventions have the most beneficial effects during this time.[1–3]

There is consensus on what children need for growth and development during these first 1000 days. A Washington DC-based nonprofit, 1000 Days, was created in 2010 to promote actions during this period, and formulated a set of evidence-based proposals for interventions to provide the best start in life for optimal growth and development.[4] In 2013, WHO published Essential Nutrition Actions, a guide that summarizes recommendations for improving nutrition for mothers and children in the first 1000 days of life.[5] Another series in *The Lancet* argues for implementation of national programs for this stage of life that reflect a multisector approach, including such vital aspects as health, nutrition, safety and protection, responsive caregiving and early learning.[3,6] Policies that prioritize such child development programs (and financial support for them) are essential to success.[7]

IMPORTANCE This article reports on Cuba's comprehensive programs for children during their first 1000 days of life, a period with exceptional opportunities to establish the foundation for optimal health and development. It also reviews Cuba's performance regarding the 1000 Days recommendations.

This article documents the main characteristics of Cuba's approach to caring for children in the various stages of the first 1000 days of life. It discusses several main achievements and the role Cuba's 1000 Days proposals play in helping every child reach their full potential. It also refers to several challenges in the current global and domestic context.

CUBA'S 1000 DAYS APPROACH

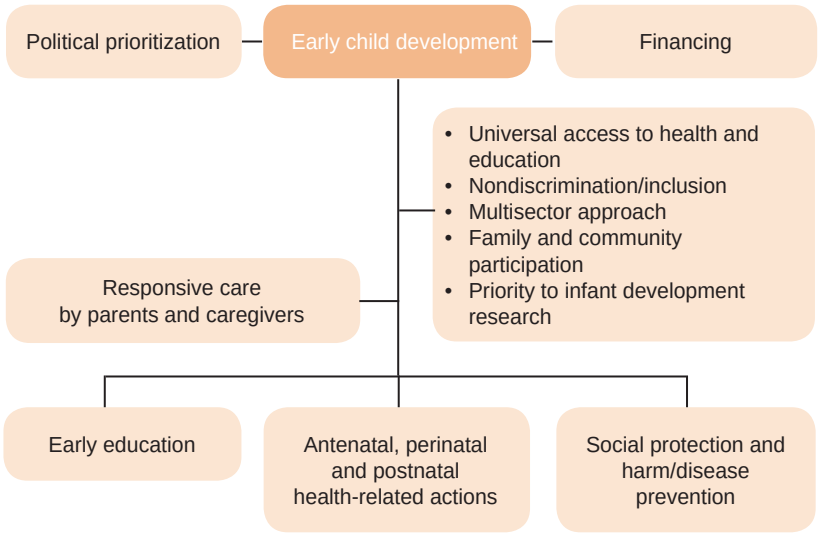
Cuba's objectives and goals for care in the first 1000 days of life are aligned with WHO's Global Strategy for Women's, Children's and Adolescents' Health (2016–2030)[8] and the UN's Sustainable Development Goals 2030.[9] These aim to ensure healthy pregnancy and birth for all mothers and optimal growth and development for all children and adolescents.

In line with these global platforms, the Cuban government has developed a comprehensive care system to promote the best start to life for the infant population and each child's development (Figure 1). It is implemented across Cuba through the public health and education systems, and is based on health promotion and disease prevention, plus early stimulation of child development. It promotes active family and community participation, and its universal reach incorporates principles of equity and intersectoral involvement, including social welfare programs.[10]

Health care for Cuban mothers and children While many sectors must play a role in meeting the needs of small children, health institutions provide a critical starting point, due to the impact of their services for pregnant women, small children and families. Cuba's universal public health system assures delivery of such interventions through various national programs for the obstetric and pediatric populations.[3]

In particular, the National Health System promotes maternal and child health during the 3 stages of the first 1000 days of life:

Figure 1: Comprehensive care system for Cuban children under two years



antenatal, perinatal and postnatal (corresponding to pregnancy, lactation and early infancy) through its National Maternal–Child Health Program. It rests on a primary health care foundation, with services assured through 10,869 family doctor-and-nurse offices distributed in neighborhoods nationwide, each affiliated with one of 450 polyclinics (multispecialty primary care clinics), providing universal coverage to Cuba's 11,239,114 inhabitants, of whom 120,458 were aged <1 year and 498,723 were aged 1–4 years in 2016 data.[11–13]

Health actions at key stages in the first 1000 days of life

Antenatal stage: from conception to birth Antenatal care is preceded by a program for prevention of reproductive risk prior to pregnancy. This program represents a priority strategy to help ensure that women begin their pregnancy at the most appropriate time for their health and that of their unborn child. It provides guidance to couples on prophylactic use of folic acid and helps detect preconception risk factors or diseases to offer possible interventions. As a result of these services and educational programs, 74% of Cuban women who are married or in a committed relationship use some type of contraception.[14]

Once pregnancy has begun, various actions help mothers and families adequately prepare—both physically and emotionally—for gestation, delivery and childrearing. The main ones at this stage include:

- add women to the pregnancy roster of their family doctor-and-nurse team early in gestation (before 12 weeks), to ensure care specific to their condition;
- in normal pregnancies, ensure ten family doctor appointments over the duration of pregnancy and four with an obstetrician;
- ensure up-to-date maternal vaccinations;
- ensure cervical cancer screening is up to date;
- when risk factors are found, recommend additional tests for women and their partner(s);
- screen for cervicovaginal infections, asymptomatic bacteriuria, cervical changes and arboviral infections;
- prepare prospective parents physically and psychologically for childbirth and offer guidance on responsive parenting;
- provide preconception and antenatal genetic counseling, and implement programs for detection of congenital abnormalities and genetic diseases that enable couples to make informed decisions regarding pregnancy continuation when fetal problems are discovered; and
- ensure delivery by qualified birth attendants in a health care facility (While antenatal care is provided by primary health care services at the community level, virtually all deliveries, including those in remote areas, take place in health care institutions, attended by qualified personnel, 99.9% in 2016). [12]

Three important aspects are addressed in followup during this period: nutrition for pregnant women, antenatal stimulation and antenatal well-child counselling.

Nutrition for pregnant women. Good nutrition from the first moments of life provides the resources needed for proper brain and immune system development and for healthy growth. Nutrition also plays an important part in pregnancy through its action at the epigenetic level, and its effects can be seen throughout life—for example, in a predisposition to obesity and certain chronic diseases. Moreover, such epigenetic changes can be passed on to succeeding generations.[4]

Pregnant Cuban women are given supplemental iron and folic acid and provided with a government-subsidized food basket from the 14th week of pregnancy. If needed, they can be admitted to maternity homes, which were created in the 1960s. These homes, an example of intersectoral practice, emerged to promote institutional delivery by pregnant women living in remote areas and to provide adequate nutrition. They later diversified their services to provide care for at-risk women at any stage of pregnancy and became an essential resource for antenatal care. Cuba's 131 maternity homes currently accept women with at-risk pregnancies not requiring hospitalization, ensuring them on-site medical care, appropriate diet, education about parenting and a supportive environment.[12,15]

Antenatal stimulation. In antenatal visits, parents are taught the benefits of fetal motor, visual and auditory stimulation for cerebral and sensory development, and subsequent physical, psychological and social development. They are also taught how to provide such stimulation, which in addition helps foster a caring connection between parents and their unborn child. This is especially important in the second and third trimesters; thus at 20 weeks, parents learn to communicate with their unborn child, which also helps them prepare physically and emotionally to welcome the infant into the family.[16]

Antenatal well-child counselling. This is provided during pregnancy to help parents prepare to care for their child. Topics covered include the value of exclusive breastfeeding in the first six months (supplemented with other foods after this age), and the importance of ongoing well-baby visits. Physiological events in the first days of life are explained to both parents and family members during house calls and antenatal doctor visits, and information provided on prevention of unintentional injuries (e.g., asphyxia from cosleeping or incorrect sleeping positions), as well as the infant's need for stimulation and affection.[17]

Perinatal and postnatal stages: newborns and young children up to two years Comprehensive care in early childhood is carried out through well-child visits that provide multidisciplinary advice aimed at promoting optimal growth and development, preventing disease and reducing risks, identifying and managing health problems early, guiding parents to care for their children and teaching them to care for themselves.[17] Metabolic screening tests are performed in newborns for early detection of congenital hypothyroidism, phenylketonuria, congenital adrenal hyperplasia, biotinidase deficiency and galactosemia. Other programs apply specific strategies to control childhood communicable diseases (e.g., immunization), implementing national action plans in primary and secondary care settings using guidelines for control of diarrheal and acute respiratory diseases, infectious neurological diseases and arboviral diseases.

Family doctors and nurses hold well-child visits in their offices (with support from polyclinic pediatricians, as needed), frequency depending on age and health status. In these visits, providers monitor health and physical and psychomotor development and offer counseling on nutrition, hygiene, immunization and early stimulation. Parents are advised how to manage emergencies. Followup house calls also allow health personnel to gain a better understanding and appreciation of family conditions and lifestyle.

Nutrition education is provided through guidelines for children aged <2 years, and growth is monitored in well-child visits to detect and help correct nutritional deficiencies and excess weight gain. Another program promotes exclusive breastfeeding during the first six months and continued breastfeeding until age two years. A network of human milk banks, based in provincial maternity hospitals, distributes quality human milk provided by voluntary donors to the most vulnerable children.[18] A subsidized food support program for children, similar to that for pregnant women, provides all Cuban children one liter of milk per day up to age seven years, among other foodstuffs.

The quality of well-child followup is continuously monitored in order to improve results in areas where there are important challenges for comprehensive care, such as breastfeeding duration and prevalence of anemia and overweight.

Early childhood education Cuban children receive early education services via two routes, institutional and extrainstitutional. The institutional one involves *círculos infantiles* (daycare centers for children of working mothers). Infants can attend daycare centers as soon as they are able to walk (around one year) and until they reach age six years. About 18% of Cuban children attend these círculos.

The extrainstitutional route is the Educate Your Child program, which reaches about 68% of parents. Program promoters in each community recruit and train voluteers to deliver early childhood education. The program is managed through collaborating groups at various political and administrative levels in Cuba, coordinated by the Ministry of Education. It also involves several other sectors and organizations, including health, justice, culture, sports, social assistance, radio and television, mass organizations, research centers and universities.

The program is based on family, community and intersectoral action, and promotes training families to improve their skills to carry out activities to stimulate child development at home. Community activities are organized to stimulate language and development of intellectual, motor and social skills. The program pays special attention to fathers' active participation. UNICEF provides some guidance for the program and has recognized it as an example of good practices in child health.[11]

Social protection Cuban working women are entitled to paid parental leave. From 34 weeks' gestation until 12 weeks after delivery, the benefit is 100% of the average weekly wage received over the 12 months prior to leave. After 12 weeks and until the end of the infant's first year, mothers who choose not to go back to work receive 60% of their wage.[19] Parental leave may be shared with the father or a grandparent after the child reaches age six months (before which, exclusive breastfeeding is recommended).[10]

In coordination with the Ministry of Public Health, all births are officially registered with the Ministry of Justice before newborns and mothers are discharged. Cuba is a party to the UN Convention on the Rights of the Child[20] and makes no distinction between children of married or unmarried parents.

A prevention system serves children with social, health, economic and family problems, and various programs (among them, Educate Your Child) provide attention to children with disabilities or without parental care. The Educate Your Child program's coordinating groups in each locality help develop intersectoral intervention strategies for such cases, with family participation, and solutions are sought at different levels, from local to national.[8]

Research on child health and development There is consensus on global research priorities to promote early childhood development in order to reach the Sustainable Development Goals.[21] In Cuba, periodic studies of infant development conducted over more than four decades have provided information for formulating strategies to improve children's wellbeing and quality of life. This research includes periodic population studies of growth and development of children and adolescents, and the Multiple Indicator Cluster Surveys carried out with UNICEF.[14,22]

Table 1 shows key actions implemented in Cuba and indicators of progress on the 1000 Days proposals. Overall, Cuba's performance is quite positive. Particularly noteworthy are results related to care of children and mothers, and the high proportion of Cuba's national budget allocated to health and education. In 2017, there were over one million well-child visits for children aged <1 year, with an average of 14.6 per child.[12]

The actions described above, while they may not be deemed causal, have likely contributed to Cuba's achievement of various important indicators (most recent years for which data are available):

- under 5 survival 99.5% in 2017;[12]
- infant mortality rate remaining under 5 deaths per 1000 live births for 10 consecutive years; 4 per 1000 in 2017, the lowest in Cuba's history;[12]
- low birth weight prevalence 5.1% in 2017;[12]

- 7% growth retardation and 17% excess weight and obesity among children aged <5 years;[11,27]
- vaccination coverage >99% against polio, diphtheria, tetanus, whooping cough, mumps, measles, rubella, meningococcus, hepatitis B, *H. influenzae* b and tuberculosis;[12]
- access to improved drinking water sources for 94.2%, improved sanitation services for 90.7%;[14]
- >90% of children aged 1 year in the Educate Your Child program (2014) meeting indicators in all developmental spheres (intellectual, physical, socioaffective and language);[8]
- Cuban women highly educated, with 99.7% literacy and average of 12.4 years of formal education,[28] 55.8% with at least high school or technical education, 14.5% university educated.[14]

Cuba still faces challenges in meeting food- and nutrition-related goals. It is particularly important to increase breastfeeding rates and reduce anemia prevalence in pregnant women and preschool children, as well as to stem the rising rates of overweight and obesity in recent years, associated with increasing incidence of non-communicable chronic diseases at early ages. It is also important to continue improving the quality of well-child visits, since they are ideal occasions for promoting health, monitoring child development, ensuring early stimulation and identifying children at risk for personalized interventions (Table 1).

CONCLUSIONS

In Cuba, care in the first 1000 days of life is provided through a comprehensive system that offers health actions, early education and social protection. While some challenges remain, the system has positively influenced indicators of infant and child survival as well as others concerning health, wellbeing, and optimal growth and development for all children. Such coordinated efforts are part of universal public health and education, also guided by intersectoral principles and participation.

Table 1: Cuba and the 1000 Days recommendations[4]

	Recommendation	Indicator
1	A healthy and nutritious diet for mothers during pregnancy	• 69% of pregnant women with acceptable weight at pregnancy onset, 16% underweight, 10% overweight, 5% obese[14] • Weight gain during pregnancy normal in 72% of mothers, 13% had low weight gain and 16% excess weight gain[14] • Prevalence of third-trimester anemia 21.6%[23]
2	Good care for all mothers during pregnancy	• Maternal mortality rate 38.3 per 100,000 live births in 2017[12] • Universal coverage for antenatal care (>10 antenatal visits per pregnancy)[14] • 99.9% of births in health institutions in 2017[12]
3	Exclusive breastfeeding for first six months	• Exclusive breastfeeding in 33.2% of babies[14]
4	Nurturing, responsive care	• Paid parental leave (shareable with other family member after child reaches 6 months) for all working mothers from 34 weeks of gestation to child's first birthday[8]
5	The right foods introduced at the right time	• 91.1% of infants aged 6–8 months with solid, semisolid or soft food[14] • 77% of infants aged 6–23 months receiving the recommended minimum frequency of meals[14] • 80.3% of infants in these age groups receiving food from four or more food groups for a varied and suitable diet[14]
6	Healthy and nutritious diet	• High[a] energy intake in 45.3% of children aged <1 year, 21.7% of children aged 1–2 years[24] • High[a] protein consumption in 74.6% of children aged <1 year, 32.7% of children aged 1–2 years[24] • High[a] carbohydrate consumption in 50.2% of children aged <1 year, 31.1% of children aged 1–2 years[24] • Low[b] fat consumption in 31.1% of children aged <1 year, 54.4% of children aged 1–2 years[24] • Intake of several micronutrients lower than recommended, especially folic acid and iron (55.1% of respectively among children aged <1 year have <70% recommended intake of folic acid; for iron, the figure is 51.1%)[24] • Prevalence of iron deficiency anemia in children aged 6–59 months 21.6% (most common nutritional deficiency in Cuban children)[23]
7	Water and other healthy beverages with no added sugars for toddlers	• Information not available
8	The right knowledge and skills for parents and caregivers to properly nourish young children	• Food guides implemented for children aged <2 years[17] • Information provided in all activities relating to education and health of small children[17]
9	Consistent access to enough nutritious food for families of young children	• Prevalence of underfeeding <2.5% in 2014–2016[25]
10	Societal investments in child wellbeing	• 27% of 2018 national budget allocated to health and social welfare, 21% to education[26]

[a] >110% of recommended [b] <70% of recommended

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Submitted: March 2, 2018
Approved for publication: December 27, 2018
Disclosure: None

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Team Science and Accelerated Vaccine Introduction in Cuba: A View from the Pneumococcal Project

Nivaldo Linares-Pérez MD MS PhD

Translated from Spanish and reprinted with permission from Revista Cubana de Salud Pública Vol 44 No 2, Apr–Jun 2018.
Original available from: http://www.revsaludpublica.sld.cu/index.php/spu/article/view/1065

ABSTRACT

The process of research and evaluation of new products and technologies requires a combination of transdisciplinary theoretical and methodological approaches for managing and achieving objectives. The research, development and evaluation strategy of the new Cuban pneumococcal vaccine combines the approaches of team science and accelerated vaccine introduction. These frameworks are proposed for discussions regarding biotech product evaluation, using their application to the Pneumococcus Project as an example. Emphasis is on the use of team science to eliminate obstacles to obtaining a product of great scientific and technological complexity while establishing robust scientific evidence to support its use and marketing. All of this is in support of opportune and efficient decisions for accelerated introduction of new vaccines in Cuba.

KEYWORDS Team science, vaccines, pneumococcal conjugate vaccine, Cuba

The most recent Cuban pneumococcal conjugate vaccine from the Finlay Vaccine Institute (IFV) marks another milestone in Cuban vaccinology (Galindo, 2015, personal communication). The research, development and evaluation strategies use the perspective of two approaches: team science[1] and accelerated vaccine introduction,[2] both adapted to the Cuban context. As reported in several national[3] and international publications,[4] Cuban clinical trials to date have demonstrated satisfactory safety and immunogenicity.[5–7]

Team science is a collaborative and multidisciplinary approach that involves bringing together scientific partners, manufacturers and managers to work toward a shared purpose or objective.[1] From the start, this has been the case with the Pneumococcus Project for research, development, evaluation, production and rapid introduction of the new vaccine after its registration in Cuba. The effort entails the combination of public financing from the Cuban government, available through the Fund for Science (FONCI), and the Finlay Vaccine Institute, of the BioCubaFarma Business Group, with technical assistance from the National Health System, such as the Pedro Kourí Tropical Medicine Institute (IPK); the National School of Public Health (ENSAP); the Provincial Health Services (SPS) of Cienfuegos, Havana and Santiago de Cuba; and the Ministry of Public Health (MINSAP) national programs.[8]

Although Cuba has not yet introduced pneumococcal vaccination, mainly due to the high cost of vaccines available in the international market, the Pneumococcus Project was designed to reduce the usual delays in new vaccine introduction; address the prevalent lack of appreciation of vaccine's value as a health technology; maximize the strengths of health services where vaccines are evaluated and applied; and capitalize on interest in and political will for the vaccine's development.

The approach of accelerated vaccine introduction[2] has been applied in the Pneumococcus Project since its inception in 2006. Institutional efforts to support development of the new vaccine, have provided a strategy that can be applied to other new vaccines, to help accelerate procedures concerning:

1. raising awareness of the need for evidence on preventable health problems after vaccine introduction;
2. clinical, epidemiological and impact evaluation research to answer key questions that support the vaccine's use and long-term sustainability; and
3. national, territorial and local coordination to ensure successful introduction in Cuba's National Immunization Program.

Scientific evidence on safety, immunogenicity, efficacy, and the direct and indirect effects of pneumococcal conjugate vaccines (PCV)—especially PCV7, PCV10 and PCV13—has been reviewed by various groups of researchers from different parts of the world. There is consensus on vaccine safety in children and infants,[9] immunogenicity depending on the various schedules used,[10] the effect of different vaccination schedules on nasopharyngeal colonization,[11] effectiveness of different vaccination schedules in reducing invasive pneumococcal disease in diverse target populations,[12,13] indirect effects on pneumococcal disease and carrier status in unvaccinated populations,[14] differential impact of vaccine administration in different regions and in presence of covariates associated with PCV immunogenicity[15] in older pediatric age groups in low- and middle-income countries,[16] and the cost–effectiveness of pneumococcal vaccination in the pediatric population of middle-income countries.[17]

The new vaccine has been designed to be used in Cuba and in other countries, following a closed-loop development model (research, development, evaluation, production and marketing), committed, as much as possible, to its accelerated introduction despite the complex process of technological application, concerns about long-term availability, restrictions on supply of necessary materials, and scarce evidence on the burden of disease associated with pneumococcal infection (due to difficulties in microbiological, clinical and epidemiological surveillance). Surveillance is essential to establish a baseline and monitor changes in effectiveness and impact on the health of Cuba's pediatric population after introduction.

Impacts expected from the Pneumococcus Project include academic, technological, social and economic results. However, the main contribution of this project is undoubtedly social, since

the vaccine's introduction in the National Vaccination Program will reduce morbidity and mortality caused by invasive pneumococcal diseases, as well as by other associated [noninvasive—Eds.] diseases in the Cuban pediatric population. Adults aged >65 years and other unvaccinated population groups will also be indirectly protected. The knowledge generated in terms of basic and applied research will enable new conjugate vaccine projects in the near future. From an economic point of view, this will affect ability to produce the vaccine under Good Practice conditions. The conjugate vaccine can be a source of export earnings for Cuba.

Team science and accelerated vaccine introduction[2] approaches in the development of the new vaccine have contributed to development of great technical experience in the fields of basic research, pharmaceutical and technological development, clinical and health impact assessment, sanitary regulations, and production. They lay the foundation for obtaining sanitary and manufacturing licenses. The Pneumococcus Project has made progress in eliminating obstacles to obtaining the most scientifically and technologically complex vaccine yet developed in Cuba, as well as in generating the safety, efficacy and cost–effectiveness evidence required for registration and marketing of this novel product and for health authorities' decision-making on its introduction in Cuba.[8]

ACKNOWLEDGMENTS

We are indebted to the scientific and professional staff of IFV, IPK, ENSAP and the Sentinel Network for Vaccine Research, Surveillance and Impact Evaluation who participated in the Pneumococcus Project, especially in research and development and strategies for surveillance & evaluation.

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A US Patient in Havana: Health Care the Cuban Way

Deborah Kirkland MPH

As a nurse and doctoral candidate, I learned from my research in and about Cuba that the country has an international reputation for having an excellent health system, providing universal care for its citizens, with major indicators—such as life expectancy—rivaling those of industrialized countries, including the USA. Little did I know that I would be accessing this health care system myself.

Prior to my September 2018 trip to Cuba, I visited my primary care physician who referred me to a gastroenterologist for chronic gastrointestinal symptoms. After approval from my insurance company, the specialist conducted high-tech procedures, including a colonoscopy, esophagogastroduodenoscopy and abdominal CT. All tests came back negative. I left the specialist with no diagnosis or treatment, other than advice to follow up with my primary care physician. My insurance covered my medical expenses, but I was responsible for fairly substantial co-pays. I departed for Cuba, relieved that nothing had been found, but still perplexed about the cause of my symptoms.

When I started getting sick in Cuba, I treated myself with over-the-counter medications, as I had been doing at home. By the following week, this was no longer working, and Frank, owner of the house where I was staying, took me to the emergency room (ER) at Clínica Central Cira García [a fee-for-service and insurance-based hospital serving foreigners—Eds.]. Laboratory tests were performed and I was diagnosed with acute gastroenteritis; I was given intravenous (IV) fluids, medications and a detailed instruction sheet, including dietary restrictions and suggestions. Frank assumed responsibility for me, brought me food and fluids from my instruction sheet and counseled me to trust the doctor and the treatment.

Over the next two days, my health deteriorated; I went back to the ER and was admitted to the hospital. As I got set up in my new quarters, the admitting doctor assured me he would take care of me. I received continuous IV fluids and got plenty of rest. The next morning I was able to shower and was taken for a chest x-ray and abdominal ultrasound, then back to my room for breakfast. I was impressed by the seamless coordination of these steps, scheduled for my convenience, and I received the x-ray and ultrasound in one trip out of my room. I could see that my hospital care was based on medical science and focused on meeting my basic needs for rest, comfort, hygiene, nutrition and safety. My food in the hospital followed the same guidelines as the initial diet I was given. I was checked on often, my blood pressure was monitored, and I was given medications to treat my elevated blood pressure and to calm my gastrointestinal tract.

I responded to the treatment immediately and, though weak, steadily improved. The admitting doctor also diagnosed gallstones, something that wasn't detected by the analyses performed at home. My symptoms abated and I was discharged a few days later. My hospital bill was covered in full by the Cuban medical insurance included in my airline ticket.

Although this hospital may be more efficient, with shorter wait times than those serving the general public free of charge, this experience provided me an inside look at Cuba's health care philosophy and the quality of medical training [All doctors working at Cira García are educated in Cuba—Eds.]. Before I became ill, I had visited a *consultorio* (neighborhood family doctor-and-nurse office), a polyclinic (multispecialty primary care center to which several consultorios report) and a major public hospital, as well as the Latin American Medical School, which trains foreign students from over 100 countries, including some 200 from the USA. Since my illness, I've had time to think about the differences between Cuba's system and that of my home country. What I've found is that Cuba's approach to patient care compares favorably to that of the USA. The model combines a holistic approach to medical science, as well as modern technologies, to diagnose and treat.

I was particularly struck by the way health care operates in Cuba. First, my new friends and colleagues were so helpful in my time of need, and I consider them vital to my care and recovery. People in Cuba are naturally interested and willing to help out—in fact, it is standard hospital care for each patient to be accompanied around the clock by at least one family member or friend. All the Cubans I encountered believe in health for all and were clear on both the importance of prevention and following medical advice.

Health professionals employ many strategies for conveying concern, including the caring touch and small gestures of helpful assistance. Examples of caring may be found in US hospitals to be sure, but, as a nurse, I can attest to the pressures and time constraints that limit simple acts of caring. Health care in the USA can also be a piecemeal affair, dependent on insurance coverage and technologies; it's very high tech, but often low on human interaction and expressions of caring—areas where Cuban health providers generally excel. In the US, health care often depends on the patient's level of insurance and/or ability to pay out-of-pocket expenses, since no insurance pays 100% of costs.

In Cuba, medical care includes a comprehensive diagnostic approach, focusing on physical examination and the most likely causes of illness. In my case, I would have seen a specialist if my symptoms hadn't responded to treatment, but the admitting doctor took it upon himself to rule out the most common causes of symptoms and provide medical care—from dietary choices, to fluid replacement and appropriate medications to treat my acute gastroenteritis—as well as social support to get me on my feet again. I experienced the best care during a difficult episode of my life, away from family, in an unfamiliar country; I wasn't even able to communicate very well in Spanish. So I am particularly grateful that I was in a country so well equipped to meet my needs. Not only did the insights I gained help me recover, they will also considerably enrich my ongoing research into Cuban health care.

Submitted: December 5, 2018
Approved for publication: January 20, 2019
Disclosures: None
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