International Collaborative Research with Developing Countries

A Colombian Model for Decreasing Infant Mortality

by

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10/31/06

A Master's paper submitted to the faculty of the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Master of Public Health in the School of Public Health, Public Health Leadership Program.

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ABSTRACT

Current collaborative efforts in international research with developing countries are frequently paternalistic and deprive developing countries of the autonomy necessary to build independent research capacity. Developing countries have become progressively suspicious of the underlying intentions of corporate sponsored research as well as the motives behind research endeavors originated in developed countries that have minimal impact on the health care needs of their populations. The current trend towards globalization requires that certain standards be established to guide these collaborative efforts in order to create strong partnerships that promote global health in less developed countries. The objective of this paper is to present a comprehensive approach to health related international collaborative research with developing countries using as an example a model that has been developed in Colombia, S.A. that changes the prevailing paradigm of collaboration and promotes infant health.

Specific Objectives

- Summarize global aspects of neonatal and infant mortality.
- Delineate the role of international collaborative research as a tool for enhancing autonomy and development.
- Define the current paradigms for international collaborative research with developing countries.
- Describe research productivity in Colombia through published peer-reviewed articles in Medline/Pubmed (2003-2005).
- Identify areas of weakness in health research in Colombia.
• Paradigm change. Colombia a case in study.

• Describe the role of trans-cultural and trans-continental virtual organizations for collaborative research and their challenges.

• Describe the core competencies required to embark on successful collaborative efforts with developing countries.

• Describe general ethical guidelines for conducting research collaborations in developing countries.
Introduction

Almost 11 million children under 5 years of age die annually and more than 95% of these deaths occur in developing countries.\(^1\)\(^2\) Approximately 38% of the total child mortality worldwide (4 million deaths) occurs in the first 4 weeks of life, and 99% of these deaths arise in low-income and middle-income countries, yet most epidemiologic and other research focuses on the 1% of deaths in higher income countries.\(^3\) A similar number are stillborn and 0.5 million mothers die from pregnancy-related causes.\(^1\)\(^3\)

Between 1980 and 2000, child mortality after the first month of life fell by a third, whereas the neonatal mortality rate (NMR) was reduced by only a quarter. To meet the Millennium Developmental Goals (MDG-4), a substantial reduction in NMRs in high-mortality countries is needed, and reducing deaths in the first week of life will be essential to progress.\(^3\) Globally, the main causes of neonatal death are preterm births (28%), severe infections (26%), and asphyxia (23%).\(^3\) It is in these three areas that public health, evidence based interventions, and local and international collaborative research efforts should focus their attention in order to decrease global neonatal and infant mortality. In addition to mortality, these three neonatal conditions cause considerable long term morbidity increasing the demand for services.\(^2\) The absence of adequate follow-up and rehabilitation services has the potential to limit even further functional and cognitive development if these services are not provided concurrently with efforts to improve infant mortality.

Governments, academic centers, and private organizations in both developed and developing countries are challenged to share a common vision in order to transition from passive observers of global health inequities to active participants in the process of
minimizing this problem. Those that have embraced the challenge through collaborative
efforts have understood the potential deleterious effects of disregarding global health as a
major concern for all nations.

International collaborative research has the potential to facilitate the process of
developing low-cost, high impact interventions as well as implementing evidence based
interventions that are safe and efficacious (i.e., Kangaroo Mother Care, Oral
Dehydration) as a means to decrease infant mortality in middle and low income
countries. Combining resources from both developed and developing countries, if done
appropriately, may promote the establishment of autonomous research capacity in
developing countries that address the primary health problems of these high risk
populations. Research aimed at improving health systems and identifying evidenced
based interventions around the time of childbirth have the greatest potential to reduce
neonatal mortality, stillbirths and maternal deaths. Furthermore, translating evidence-
based knowledge into public health policy and practice is essential to achieving this goal.

This paper reviews the prevailing paradigm of international collaborative health
research and presents a model that has been developed in Colombia, South America, for
changing this paradigm to one that supports autonomy and development of research
capacity.

**Prevailing paradigm**

To describe the current paradigm for international collaborative health research
with developing countries, we must first identify the underling mechanisms that originate
and sustain it. For decades, research has been the privilege of developed countries, while
developing countries sit on the sidelines waiting for new and expensive technologies that eventually will be offered to a limited segment of their populations. In many cases these new technologies will not be marketed in developing countries because of socio-political obstacles, high cost and limited profits.6

Until recently, very little effort has been invested on the part of developed countries to promote research in developing countries. Of the global budget for health research, only 10% is spent on the disease burden of 90% of the world’s population (10/90 gap).7 Best estimates are that the total spent on health research of any kind is around $70 billion US dollars. The National Institutes of Health (NIH) alone spent close to $27 billion on medical research in 2003. The pharmaceutical industry, overwhelmingly based either in the United States or the European Union, will spend about $30 billion. In all, less than $3 billion of funding originates from the poorer parts of the world.7 Other factors that limit investment of research dollars in developing countries include: market constraints on drug research, language and logistic barriers, limited research capacity, inadequate administrative and accountability standards, and the stereotypic belief that research done in developing countries is poor quality research.8,9

Because of limited resources, developing countries have traditionally assigned very small portions of their gross domestic product (GDP) to health care and research (< 4%), countries with the highest infant mortality rates spend on average 4.8% of their GDP on health care compared to 8.6% in countries with low infant mortality.1 Recent studies have shown that the burden of disease in developing countries is high, particularly the burden of infectious, communicable and non-communicable disease and health problems of mothers and children. There is presently a mismatch between this health burden and
the technical and human capacity of developing countries to use existing knowledge and to generate new knowledge to overcome this burden. 8

Because physicians in many developing countries are paid low wages and funding for career development and research is scarce, those interested in academia and research can only dedicate a small portion of their daily activities to these efforts or renounce entirely their pursuit of research as a career. Many investigators must moonlight in other jobs or do private practice to support their families, with inevitable effects on time available for research. 10 Full time academic researchers are far and few and economic decline and structural adjustment programs imposed on many developing countries have led to drastic cuts in numbers of academic staff and salary levels, and a lack of equipment and training opportunities. 10,11 Brain drain due to better standards of living and quality of life, higher salaries (in some cases 25 times higher), access to advanced technology and more stable political conditions in the developed countries attract talent from less developed areas. Increased momentum and demand for skilled people by high tech and research and development (R&D) industries accelerate flows of highly skilled workers to developed nations further depleting local research capacity. 11,12 Most of the migration of health professionals is occurring from countries with physician densities of about 17 per 100,000 population to countries with densities of 300 per 100,000 population. 12

Developed countries unintentionally contribute to the prevalence of this paradigm by promoting models of collaborative research that are paternalistic and deprive developing countries of the support necessary to build and retain their own research capacity. Costello et al. 10 believe that the prevailing research model supported by many funding agencies remains semicolonial in nature and that foreign domination in setting
research priorities and project management may have negative consequences which outweigh the apparent benefits of the research findings. Grant support for collaborative international research sponsored by government and private entities in developed countries in many cases require that the coordinating center be based in the developed country. While the previous approaches to collaboration may help assure funding agencies that high quality research will be developed and administrative requirements be fulfilled, it deprives developing countries of the support and autonomy to develop independent research capacity and to develop the expertise they will need to assure sustainability.8,10

Developing countries, on the other hand, have become progressively suspicious of the underlying intentions of collaborative and corporate sponsored research. Researchers from developed countries who embarked in collaborative efforts in many cases were motivated by scientific interests with limited or no relevance to the health care needs of the developing country. Such was the case of researchers from a prominent academic center in the United States that partnered with a pharmaceutical company to obtain biological samples in remote areas in Anhui Province, Central China, leading to international diplomatic disagreements about issues such as the ownership of genetic material and informed consent.9,10,13 Foreign researchers tend to favor efficacy trials of novel interventions, rather than applied studies to improve the transfer of proven interventions into rational health care policy and practice.10 In many cases developing countries that have participated in these trials will not have access to these new and expensive interventions. A point in case is trastuzumab, a medication used for the treatment of breast cancer.6 In other instances, foreign collaborators obtained knowledge
from international collaborative research efforts for their own personal and financial
gains (i.e., ended berry for the treatment of schistosomiasis). Recently, “drug
companies’ quest for speedy results has led to a boom in trials based in developing
countries, where ethical standards may be lax and the impoverished sick abundant.”
According to the U.S. Department of Health and Human Services Inspector General’s
office, the number of researchers based outside the United States seeking new drug
approvals has increased 16-fold over the last decade. This quest for speedy results has
led to class-action suits against pharmaceutical companies like the one filed in 1996 by
30 Nigerian families whose children participated in a trial of a new antibiotic for the
treatment of meningitis without appropriate informed consent and safety control.

**Colombia, a case in study.**

Colombia’s level of research and development (R&D) is low, even within the
context of other Latin American and Caribbean nations. Acquisition of foreign
technology is predominant; innovations are infrequent and occur mainly through
incorporated technology while evidence-based knowledge is rarely transferred into
technological development and innovation. In Colombia, government funds for the
development of research capacity are channeled through the Colombian Institute for the
Development of Science and Technology (Colciencias). This organization is in charge of
promoting research capacity through education and the creation and support of Master,
Doctorate and Post-doctoral programs, support of existing research groups, grant support
for research projects, promotion of international collaborations, and innovation and use of
evidence-based knowledge. As a main objective, it strives to coordinate local research
efforts among academic centers and the public and private sector with the goal of
transferring knowledge into policy and practice. In Colombia, as in other developing countries, government institutions like Colciencias support research capacity through grants but their budgets are constrained, and stiff competition as well as government priorities and red tape may deter local researchers from pursuing them.

Investment in science, technology and innovation (CT+I) in 2003 was 0.38% of the GDP, with a current goal of increasing to 0.6% of GDP in 2006. Colombia is currently a member of the “international network for information sources in science, technology and innovation (SCienTI). In 2002, two database systems were created (GrupLAC and CvLAC) to accumulate and process real time information to identify and monitor research capacity. Research groups were initially classified as recognized and registered. To further categorize them based on productivity and other qualitative variables, Colciencias in partnership with other research groups developed the ScientiCol Index which classifies research groups in three categories (A, B, and C) depending on length of existence of the group, the number and quality of publications produced per year, and the visibility and application of the results. Category A was defined as a ScientiCol index ≥ 8 and at least 5 years of existence; category B, a ScientiCol index ≥ 5 and at least 3 years of existence; and category C, a ScientiCol index ≥ 2 and at least 2 years of existence. Of the 1442 recognized research groups in 2003 and 2004, 774 (53.7%) were classified according to these categories with 236 (30.5%) corresponding to category A, 276 (35.6%) to category B, and 262 (33.8%) to category C research groups. Of the 774 groups, 721 (93.1%) belonged to institutions of higher education, mostly public entities (52.7%). Medicine was the sub-area where research activity was more consolidated (77 research groups). In 2006, a significant increase in research capacity
was observed with a total of 2057 research groups identified. Of these, 547 were classified as category A and 447 (295 principal and 152 secondary) were identified as health sciences research groups with 176 dedicated exclusively to research in the sub-area of medicine.\textsuperscript{17,19}

Among 1500 approved projects by Colciencias during the period 1983 through 1994, 129 (8.6\%) had international collaboration (direct participation of one or more individuals from non-Colombian institutions). The total number of international collaborations was 210, mostly with the United States (36\%), followed by Brazil and Spain. With respect to research productivity utilizing peer-reviewed publications as a means to measure quantitative and qualitative output, of the 119 articles in which authors from foreign institutions were identified as co-authors with Colombians during this period of 1983-1994, 90.7\% were published in international journals.\textsuperscript{20} With respect to article production by field, 68\% of total bibliometric output were projects in basic sciences (physics, chemistry, mathematics, biology and earth sciences [258 in national journals, 303 in international journals]). Only 2 articles in the health sciences were published in this period (0.24\% [1 in a national journal and 1 in an international journal]) reflecting limited funding in this area.\textsuperscript{20} In 2005, health research funding by Colciencias was 6.5\% (2.6 million USD) of its total budget (40.2 million USD); whether this amount of funding is balanced with the health science research needs of the nation is questionable.\textsuperscript{21}

To determine current bibliometric output in the health sciences in Colombia, the author (MAR) reviewed all publications published in peer-reviewed journals during the years 2003-2005. The word “Colombia” was used to identify publications in
Medline/Pubmed. Categories were created to determine area of investigative focus, and to differentiate between papers published in English or Spanish peer-reviewed journals, and Colombian research groups (CRGs) versus foreign collaborative research groups (FCRGs) where Colombian researchers were invited participants (Table 1). Review articles and case studies were excluded from this analysis. A total of 539 peer-reviewed publications were identified during this period with an average of 180 publications per year. A similar proportion of publications in English and Spanish peer-reviewed journals were observed (310/539 [57.5%] versus 229/539 [42.5%]). Publications from CRGs (381 [66.8%]) were superior in number to foreign collaborative research groups (187 [32.4%]). A predominance of research publications in the area of public health (population based studies) was observed (365/539 [67.7%]), followed by clinical research (156/539 [28.9%], biomedical and genetic research (93/539 [17.2%]), and maternal and infant health research (61/539 [11.3%]). With respect to research design, in the year 2005, 52/108 (28.9%) cross sectional studies, 10/180 (5.5%) prospective cohort studies, and 5/180 (2.8%) randomized controlled trials (RCTs) were identified. The remaining studies were predominantly descriptive. During that same year, the CNRN published one of the first multi-center RCT ever conducted in Colombia in the area of neonatology.²² It is important to clarify that this analysis did not take into account funding source nor was it clear whether international collaborative research publications were the result of structured ongoing collaborations or temporary collaborations. Also, the level of international collaboration may be underestimated because abstracts of manuscripts published in Colombian journals in most cases were not accompanied by a “full text” or PDF file limiting the possibility to ascertain foreign co-investigators in theses papers.
(e.g., Biomedica, Revista de Salud Public [Bogotá]). The previous description of bibliometric output from Colombia uncovers a paucity of innovative and evidence-based research in medicine. RCTs and research in the area of mother and infant health care were observed areas of weakness. Also, current controversy on the classification of research articles based on the non-scientific method of the “impact factor” by Colciencias has placed Medline/Pubmed indexed articles as second line publications with the potential to affect both the progress of scientific research and the income of academicians in public institutions in Colombia.23

Paradigm Change

In 1997 a collaborative research partnership was established between two Colombian researchers, one living in the United States and one in Colombia. Both researchers were Colombian pediatricians, one with subspecialty training in neonatal-perinatal medicine and the other with a master in science degree. Both held faculty appointments in prestigious academic institutions in their respective country of residence (University of North Carolina, Chapel Hill and Pontificia Universidad Javeriana, Bogotá). The vision and mission of this partnership was to improve the health of the neonatal population in Colombia through the design, implementation, and conduct of relevant research that could be translated into rational health care policy and practice. A major emphasis was made on using available research capacity in order to promote its development and sustainability. We propose a model developed in this country that changes the research paradigm to one that promotes the development of autonomous research capacity and scientific output through collaborative international team efforts.
In 1986 the Clinical Epidemiology and Biostatistics Unit (CEBU) at the Universidad Javeriana was established as one of three units in Colombia through grant support given by the International Clinical Epidemiology Network (INCLEN), an organization created by the Rockefeller Foundation to promote research capacity in developing countries. For the past 22 years, INCLEN has fulfilled its mission through the creation of clinical epidemiology units in over 50 academic institutions in 24 countries around the world. It has also supported the training of over 450 graduates in clinical epidemiology, biostatistics, clinical economics, health management and other related social sciences. Currently, these units are in a transition process towards becoming self-sustainable organizations capable of competing for national and international grant support. These centers have the scientific and administrative capabilities to serve as coordinating centers for international collaborative research efforts. The Colombian based researcher (JML) has been involved with CEBU since its creation and is currently its director. This unit runs its own masters program in clinical epidemiology and recently has been upgraded to the level of department within the university and is classified as a category A research group according to the ScientiCol clasification. Over the past 20 years CEBU has developed an extensive record of research productivity and international collaborations.

Due to the paucity of experience with multi-center randomized controlled trials in the area of neonatology in Colombia, this collaborative group designed its first trial comparing two modes of ventilating near term and term infants with respiratory failure (conventional ventilation and high frequency oscillatory ventilation). Although a study of this magnitude was considered a high risk endeavor due to its complexity and cost, the
researchers felt that if successful, this study would also test the organizational skills and capabilities of the collaborative group. Two additional multi-center trials were subsequently implemented as a result of this partnership.

Organizational structure of collaboration

Due to the cross-national nature of this partnership, the collaborative group was structured as a virtual organization and specific roles were assigned to the different participants. The research infrastructure from academic institutions in both countries enabled collaborators to dedicate 30-40% of their academic time to project development while facilitating resources for communication, travel and educational enhancement (training in public health leadership). CEBU serves as the coordinating center for all research projects and is in charge of local coordination, training of research assistants, data collection, organization of educational workshops and data analysis. The Colombian researcher based in the United States (MAR) was assigned the responsibility of general coordination and project oversight, initial protocol design, project funding, development of educational workshops, data analysis and manuscript writing. Resources were pulled together from participating academic institutions to support this collaborative effort. These resources include but are not limited to biostatistician support, travel, communication, office supplies, and unexpected expenses.

Both collaborators identified and visited potential participating hospital centers and physicians. Meetings were held to describe the projects and receive feedback in relation to general interest and feasibility of the studies. A separate meeting was set up to discuss research design and ethical issues. From these discussions a final draft of the project was elaborated that represented the consensus of all potential participants. Each
potential participant then submitted the study protocol to their respective Institutional Review Boards (IRBs). The projects were simultaneously submitted to the IRB of the University of North Carolina, Chapel Hill. Only centers with a letter of approval from their respective IRBs were permitted to participate. Safety review committees were setup during the conduct of RCTs to evaluate adverse events. Consent forms were written in English and then translated into Spanish with language that was culturally and age appropriate (6th grade level). This methodology of collaborative work subsequently led to the creation of the Colombian Neonatal Research Network (CNRN), a conglomerate of 14 participating academic and private institutions with neonatal nurseries.

Communication

Communication between countries is maintained through face to face visits that occur on average twice a year and may increase in number during the initial steps of study implementation and training. E-mail and telephone conversations, including conference calls are the main means of communication and are used selectively according to the nature of the problems that need discussion. Minimizing the cost of communications is balanced with the need to keep all parties well informed. A monthly update on recruitment, protocol violations, and adverse events is sent to each principal investigator by e-mail. Communication between public and private academic and non-academic health care institutions in Colombia has also been enhanced through participation in the network’s clinical trials. This was confirmed through their active participation and compliance during research meetings and workshops.
Funding for research projects

Project funding has been obtained so far through grants from private industry where the bulk of the money is assigned to CEBU for project coordination and covers payment of research personal, paper work, transportation and miscellaneous. This approach was chosen to promote sustainability and the development of local research capacity. Data management and manuscript development is solely the responsibility of the principal investigators and conflicts of interest are disclosed prior to project implementation in order to avoid bias of participants. Overhead payments to the Pontificia Universidad Javeriana have been in the range of 15 to 25%. Remuneration for local research coordinators, associate research nurses and data collectors are paid according to Colombian government and institutional standards. Due to limited research dollars, researchers in the US have donated their time for project activities. This was deemed acceptable due to the large differences in academic remuneration between physicians in both countries. As a result of research productivity, experience, and administrative organization, CEBU and the CNRN are currently better positioned to compete for national and international funding.

Research productivity

To date the CNRN has successfully conducted 3 large multicenter studies, one prospective cohort study evaluating the epidemiology and risk factors for nosocomial infection in selected neonatal nurseries in Colombia, and two RCTs, the first described above, and the second, a study evaluating the use of prophylactic surfactant and nasal continuous positive airway pressure (NCPAP) in preterm infants with respiratory distress syndrome as a means to decrease the need for mechanical ventilation,
a more expensive and less available intervention that is associated with lung injury and the development of chronic lung disease (study in progress). A forth RCT in its funding phase will evaluate a low cost, high-impact intervention (probiotics) as a means to decrease nosocomial infection, Gram-negative sepsis, and necrotizing enterocolitis in preterm infants. Participation in these trials has the potential to positively affect local patient care through standardization of interventions and general patient care among participating centers, as demonstrated in our first randomized controlled trial.22

Perceived barriers

The challenges of international collaborative research with developing countries are multiple and of variable complexity. Implementation and completion of research projects has been slower than expected for many reasons that include but are not limited to lack of experience with international collaborations, limited knowledge of virtual organizations, international law, local importation laws, equipment maintenance contracts and communication barriers. During the implementation of our first RCT in 1997, it was learned, that in Colombia, importation of equipment must be designated as “donated for research” to lower importation tariffs. In 2004, inexperience with customs regulations on one occasion led to a fine of over 5 million Colombian pesos (2,173 USD). Retrieving equipment from customs was a long and tedious process that delayed patient recruitment. Identifying private suppliers of parts and maintenance of imported equipment was also a challenge that on several occasions led to temporary halting of randomization when research equipment required repairs. In many cases, parts had to be imported from the United States or Australia. These costs were all unbudgeted and reduced available research funds, making it imperative to petition for additional financial support.
Additional unexpected events such as the 2005 earthquake in the city of Cali led to structural damage and temporary closure of one of our participating institutions, affecting overall patient recruitment and completion of a trial according to a planned and designated budget.

Language and cultural barriers have not been a significant problem due to the common background of both PIs who have served as translators and communication facilitators between Colombian and American research participants. In Colombia, most physicians speak English fluently but this is not the case with nursing staff and other health care personnel. We have been fortunate to include in our research team a nurse research associate (MXR) and an MD research assistant (LC) that speak both languages. Their primary role is to oversee the conduct of research projects in the different cities where these studies are implemented. Both of them hold masters in clinical epidemiology obtained from CEBU and the Pontificia Universidad Javeriana. Excellent communication skills between research coordinators and other research personnel in the different participating centers have been fundamental to trial success. The multicenter nature of this organization demands additional resources, planning and flexibility. Over the years we have also learned to be more flexible with respect to timelines as we have come to understand the additional complexities of conducting research overseas.

Intellectual ownership of the projects has been emphasized through the participation of all investigators in the different phases of project design, implementation, data analysis, and manuscript preparation. This has facilitated inclusion of all investigators from participating institutions in the authorship of manuscripts. This was perceived as an initial barrier due to limitations in the number of authors permitted by
different journals. However, this barrier was overcome by direct appeal to journals emphasizing the need to include all authors that participated in the trial, most of whom had no financial remuneration for their participation and accepted authorship as recognition for their efforts. We expect that in the future grant supported projects will cover a portion of their salaries.

A specific challenge perceived through our research collaboration was the difficulty in coordinating cross-national activities between investigational review boards in both developed and developing countries. Lack of communication and differences in expectations require further interaction, training, and collaboration in order to assure compliance to international research standards while maintaining realistic expectations. This was made evident when translating the content of the consent form which was written according to American standards. Literal translation was not possible due to different cultural and legal contexts. A simplified version was developed by the coordinating center that met the expectations of their local IRB. This document was then included in the protocol for evaluation by IRBs from participating institutions.

Institutional review boards in developed countries are challenged to acquire the appropriate competencies to interact with developing countries. We emphasize the process of thoughtful analysis and equal participation in the context of global health as the most appropriate path towards reaching consensus on the ethics of research.

Differences in standards of care between private and public institutions in Colombia in some cases have led to the exclusion of potential participating institutions. Research in limited resource countries should permit the evaluation of less expensive and innovative interventions that are traditionally not considered standard of care in
developed countries if these interventions are tested against recognized standard interventions. This was a perceived barrier during the conduct of our NCPAP trial in which some private hospitals considered this intervention a substandard method of care for infants with respiratory distress syndrome compared with intubation and mechanical ventilation even without objective data to support this belief. Effective communication, equipoise, and the availability of objective data to support research project implementation are fundamental to buy-in from all participants. It is also important to understand that “one can’t simply declare that a disease is sufficiently researched just because it no longer has an impact on the affluent world.”

Promoting the need for a global health approach to research among local institutions whether private or public may facilitate agreement on ethical standards for participation.

As a collaborative research team, we questioned our motivations for participating in international collaborative research. Academic development was an important factor for all participants. But, the collective goal of promoting local research that would lead to evidence-based interventions and improved outcomes for the neonatal population in Colombia were the major driving force behind our effort. As a group we agreed that new technologies tested would be made available in all participating institutions. All technologies were donated by the private industry as research equipment to CEBU and the CNRN, and were subsequently maid available as a loan to participating institutions once proven to be safe and efficacious after the end of the trial. We considered this approach the most appropriate to avoid dependence on gifts and to have equipment available for future research projects. Testing new technologies in developing countries should be avoided if similar arrangements are not possible. Overcoming these barriers
has facilitated the implementation of subsequent projects; although, we are well aware that each research project comes with its own distinct challenges.

**Future directions**

From a public health perspective we are aware of the need to incorporate a maternal and perinatal component of research within our network in order to comprehensibly address the health care needs of both mothers and infants. We will do this through the design of studies that focus their attention on the care of the mother and infant around the time of birth. Through these projects we expect to expand our network to include researchers from the obstetric and maternal-fetal medicine disciplines. The observed lack of research productivity in maternal and infant health care in Colombia motivates us to become advocates for future enhancement.

To improve the quality of research endeavors in Colombia, we will work towards improving communication among IRBs inside and outside of Colombia. This objective will be attained through sponsorship of educational workshops with international participation. Collaborative efforts in this area will be aimed at improving qualitative aspects of the IRB review process and will promote consistency in the ethical design and implementation of research with human subjects.

CEBU and the CNRN are challenged to work in close proximity to the political process in order to transfer evidence-based knowledge into rational health care policy and practice. Publication of results in English and Spanish peer-reviewed journals and distribution of their results through the media, scientific meetings, and directly to government entities in charge of coordinating the Colombian health care system (Ministerio de Proteccion Social, Programa de Salud Materno-Infantil, Secretarias de
Salud Departamentales, Entidades Promotoras de Salud) are a few examples of how to approach this problem.

According to Flory et al.29 "a reformed research agenda is imperative to future progress in global health. Taking on the role of a scientist brings with it the responsibility of contributing to well-ordered science. In the presence of the 10/90 gap, there’s ample reason to think that scientific research is not promoting its proper goal. Individual researchers and the institutions that fund them have an obligation to direct their research toward remedying the global research gap."

Summary

International collaborative research is an effective and efficient tool to promote autonomy, research capacity and scientific output in less developed countries if appropriately implemented. Knowledge of the dynamics of virtual organizations and cultural sensitivity are core competencies necessary for the success of these collaborative efforts. Emphasis should be placed on training future leaders that will promote collaborative research efforts that address the main health care needs of communities in developing countries. Creating strong partnerships based on mutual trust is fundamental to this objective. Supporting local research capacity will assure sustainability and ownership while limiting dependency. The Millennium Development Goals include recommendations for the creation of global partnerships to address the problems in maternal and infant health.1 Decreasing the global health and research gap is the ultimate ethical imperative.
Colombian Neonatal Research Network Participants:

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Research Productivity in Colombia Measured by Peer-Reviewed Publications

Published in English and Spanish Journals (2003-2005)

<table>
<thead>
<tr>
<th>Year</th>
<th>EPR J CRG (%)</th>
<th>SPR J CRG (%)</th>
<th>Total CRGs (%)</th>
<th>E J FCRG (%)</th>
<th>S J FCRG (%)</th>
<th>Total FCRG (%)</th>
<th>Total Publications (100%)</th>
<th>Public Health (%)</th>
<th>Clinical (%)</th>
<th>Biomedical and Genetic Research (%)</th>
<th>Maternal-infant Research (%)</th>
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<td>2003</td>
<td>48 (27.1)</td>
<td>66 (37.3)</td>
<td>114 (64.4)</td>
<td>53 (29.9)</td>
<td>10 (5.6)</td>
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PCRG, Colombian Research Group; FCRG, Foreign Collaborative Research Group; EPRJ, English peer-reviewed journal; SPRJ, Spanish peer-reviewed journal