

FINAL TECHNICAL REPORT FOR THE CINBIOSE NODE OF THE COMMUNITY OF PRACTICE IN ECOSYSTEM APPROACHES TO HUMAN HEALTH: LATIN AMERICA AND THE CARIBBEAN

“Communities of practice are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly.”¹

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¹ Wenger E, 2006 <http://www.ewenger.com/theory/>

AVANT-PROPOS

Il importe de poser certains éléments avant de présenter le rapport en tant de que tel.

- Soulignons d’abord la distinction à faire entre le « nœud Cinbiose » et le Centre interdisciplinaire de recherche sur la biologie, la santé, la société et l’environnement (Cinbiose). Le premier est partie intégrante de la Communauté de pratique en approches écosystémiques de la santé humaine de l’Amérique latine et des Caraïbes (CoPEH-LAC), le second est un centre de recherche (et centre collaborateur OMS-OPS) basé à l’UQAM. Ce rapport concerne le nœud Cinbiose.
- Pour d’évidentes raisons administratives pratiques, une part du financement de ce projet a été versée directement au Cinbiose pour l’administration du nœud, ce qui a conduit à l’obligation de produire un rapport final pour le nœud seulement. Il va sans dire que ce rapport est intrinsèquement lié au rapport de l’ensemble de la communauté – auquel les auteurs du présent rapport ont contribué. Les deux rapports se recoupent et se complètent. Nous avons tenté, dans celui-ci, de poser un « regard canadien » et de mettre l’accent sur les bénéfices pour le nœud Cinbiose.
- Bien que l’anglais ne soit pas l’une des langues de CoPEH-LAC, nous avons choisi d’écrire le rapport du nœud Cinbiose dans cette langue pour deux raisons. D’une part, parce qu’en l’écrivant en français (la langue du nœud Cinbiose), certaines ou certains de nos collègues de CoPEH-LAC auraient eu du mal à le lire et que, d’autre part, l’écriture en espagnol (la langue « principale » de CoPEH-LAC) est plus ardue pour nous.

ABSTRACT

El propósito de esta Comunidad de Práctica es promover el marco de investigación del enfoque de ecosistemas en salud humana (conceptos, métodos y herramientas) y vincular la investigación con las políticas y la acción. Esta iniciativa fortalecerá la cooperación entre científicos de Canadá y la región de América Latina y el Caribe (ALC), y contribuirá a impulsar el desarrollo de redes de investigación que estimulen el pensamiento crítico y el fortalecimiento de capacidades dentro de las instituciones de investigación, en relación con el enfoque ecosistémico en la salud humana.

En la fase II, se buscará la forma de hacer sostenible el actual COPEH promoviendo la diversidad en nuestras fuentes de financiamiento mediante la movilización de recursos y la búsqueda de asociaciones estratégicas. Las actividades nodales presentadas durante la primera fase ha dado lugar a la integración en el enfoque de eco salud dentro de muchas investigaciones y proyectos de extensión. Como primer paso en el proceso de movilización de recursos se reportarán los resultados de los trabajos que se realizaron en la primera fase, presentando artículos en revistas científicas, además de la divulgación en conferencias nacionales e internacionales; y a fin de lograr la sostenibilidad y garantizar la aplicación del enfoque en las investigaciones y en proyectos de intervención, todos los nodos participarán en un esfuerzo concertado para incluir el enfoque de eco salud en los planes de estudios académicos y de extensión. En esta fase se propone un programa de enseñanza extensivo de eco salud para académicos, organizaciones gubernamentales y no gubernamentales. Además, mientras la primera fase sirvió para consolidar los nodos regionales e iniciar las colaboraciones sur-sur dentro de COPEH, en la segunda fase, nuestro programa fomentará las colaboraciones ínter nodales a través de actividades temáticas directamente relacionadas con eco salud.

El proceso de evaluación, usando el análisis de redes de comunicación social, nos ha dado un mejor entendimiento de la evolución de nuestra comunidad de práctica identificando sus fortalezas y debilidades. Así, se propone continuar y profundizar esta evaluación en la segunda fase para entender mejor el funcionamiento interno de COPEH y del alcance de sus actividades, particularmente dentro de las instituciones y de los encargados de formular políticas.

Keywords: Community of Practice, EcoHealth, Latin America, Environmental Health, Occupational Health, Gender, Equity

Avant-propos	2
Abstract.....	3
Summary: your project’s ecohealth story	5
The development problem: context, goals and objectives	6
Methodology.....	7
Project activities	9
Ressources	13
Key Research Results	13
Development of knowlegde and capacity	13
Development of CoPEH-LAC	14
Models	14
Project outputs and development outcomes	15
South-North transfer	15
Advancing ecohealth approaches through research	15
Consolidate social, academic and political relationships.....	17
Application and integration of ecosystem approaches	17
Project impacts.....	18
Your project’s ecohealth story	18
Overall assessment and recommendations.....	19

SUMMARY: YOUR PROJECT'S ECOHEALTH STORY

In 2004, the Canadian Institutes for Health Research (CIHR) put out a call for proposals for researchers from Canada and Latin American and the Caribbean (LAC) to jointly develop and submit proposals that contribute to the consolidation and expansion of a global Community of Practice in Ecohealth (COPEH) in LAC². In the call, CIHR indicated: *“The aim of this Community of Practice (CoP) is to advance the ecosystem approaches to human health research framework and to link research to policy and action. This collaboration will strengthen cooperation between scientists in Canada and the LAC region, and assist with the development of research networks to stimulate critical thinking and capacity building within research institutions related to ecosystem approaches to human health.”* In response to this call for proposals, Donna Mergler from the Centre for Interdisciplinary Research in Biology, Health, Environment and Society (CINBIOSE) at the *Université du Québec à Montréal* organized a meeting with Latin American researchers from Universities and NGOs, who had experience in ecosystem approaches to human health or were involved in projects with similar frameworks, including social and collective medicine, environmental and occupational studies with community participation and a gender-oriented approach. Together they wrote a proposal for a Community of Practice in Ecosystem Approaches to Toxics in Latin America and the Caribbean. It included a structure comprising 6 nodes, representing 5 LAC regions (Mexico, Central America and the Caribbean, the Andean Region, the Southern Cone, Brazil) and CINBIOSE (Quebec/Canada). The activities and successes of COPEH-TLAC are documented in the final report submitted to IDRC in 2008. A second phase of this project was funded in 2009 for three years for which our COPEH enlarged its horizon to include Ecohealth activities other than toxics and modified its name to CoPEH-LAC. Its overall objectives were to further the construction of an active and effective Community of Practice that is strengthening Ecohealth research and interventions throughout LAC in order to help bring about lasting changes in health and environment. CINBIOSE's activities during the second phase of CoPEH-LAC are reported in its final report. In this final report from CINBIOSE, rather than repeating the list of activities in which CINBIOSE participated, including the reflections and evaluation of CoPEH-LAC, we examine our role, as Canadians, in a COPEH, whose overall objective was to foster and further Ecohealth approaches in LAC.

Our Ecohealth story within CoPEH-LAC divides well into two phases. In the first phase, Cinbiose played a foundational role in the birth of the community of practice focussing on its initial formation and growth. In the second phase, the role of CINBIOSE primarily involved (i) support to workshops and training in Ecohealth approaches organized by our colleagues in LAC; (ii) collaboration on research projects based on ecosystem approaches to human health; (iii) brokering between our LAC colleagues and our Canadian colleagues, in COPEH-Canada and the Global Health Research Capacity Strengthening Program; (iv) concerting our efforts with other nodes and COPEH WHO-PAHO Collaborating Centres to have ecosystem approaches to health put forward in PAHO strategic programs in environmental and occupational health. CINBIOSE's work, contacts and collaborations within CoPEH-LAC, allowed us to better orient and develop our own approaches to the study of the complex pathways between ecosystems and health. We learned about the diversity of ecosystems and the socio-politico-cultural traditions and realities in LAC regions. We widened our collaborations, which now include Ecohealth projects with colleagues throughout LA. Through our work in CoPEH-LAC, we enriched our own research and understanding of the links between research and policy-making, and passed this knowledge to our Canadian students and colleagues. Within the last months of our grant period, our collaboration with our LAC colleagues evolved into a Pan-American partnership for the strengthening of research, policy and practice at the intersection of health,

² <http://www.cihr-irsc.gc.ca/e/22266.html>

ecosystems and society.

THE DEVELOPMENT PROBLEM: CONTEXT, GOALS AND OBJECTIVES

Context: Canadian researchers have played a key role in the development of Ecosystem approaches and IDRC has extended and enriched this knowledge through its Ecohealth program targeting poor and middle-income countries. CINBIOSE, a Canadian university-based research centre, adopted Ecohealth approaches in its environmental and occupational health research in the early nineties. Concurrently, CINBIOSE researchers were involved in a number of studies and training programs with colleagues throughout Latin America, notably in Brazil, Chile, Costa Rica, Ecuador, Peru and Venezuela. Through CoPEH-LAC, our cooperation became more structured and grew, benefitting Ecohealth-based research, academic programs and policy-making in Latin America, Canada and worldwide.

In the Americas, for academics, NGOs, and even in government, collaborations are most often North-South, and there are relatively few horizontal links. This is true not only for Latin America and the Caribbean, but also for Canada. For example, prior to the formation of COPEH-Canada, Ecohealth researchers in the different universities across Canada had strong ties with partners in middle and low-income countries, but there was little pan-Canadian collaboration. CINBIOSE, as the initiator of CoPEH-LAC, saw as its challenge to foster links and partnerships between people, organizations and regions of LAC while providing the space for the LAC partners to lead these initiatives. Over time, and from the first phase to the second phase of CoPEH-LAC, the role of CINBIOSE transformed from a central role of broker into that of a catalyzer. In this capacity, CINBIOSE made itself available to participate in the activities aimed at promoting the ecosystem approaches in the region, which were designed, coordinated and carried out by the LAC members of the COPEH. This transition from a leading to a supporting role is well illustrated by the network analysis that we used to evaluate CoPEH-LAC.

CINBIOSE's goals within CoPEH-LAC. Without wanting to play on words, in this second phase of CoPEH-LAC, CINBIOSE sought a true symbiotic relationship with the other nodes in CoPEH-LAC. The rich knowledge in social and collective medicine and participatory methodologies in LAC contributed to our understanding and practice of intervention-based Ecohealth research and furthered innovative approaches. On the other hand, CINBIOSE worked towards minimizing the North-South inequities, which are omnipresent in the academic milieu, by providing our colleagues with greater access to funding opportunities, support, technological advances, training in state of the art research techniques and scientific publications in the area of Ecohealth. Finally, working together, we could join our efforts towards translating research into policy through organisations like the Pan-American Health Organization³. The dynamic has worked well and the social network communication analysis shows that CoPEH-LAC has evolved from a structure where CINBIOSE was the most central and intermediary player to a more horizontal less centralised structure (see Appendix I).

CINBIOSE's objectives of the second phase. As a CoPEH-LAC node, CINBIOSE's objectives in the 2nd phase, as stated in our proposal, were to i) participate in the administrative aspects of CoPEH-LAC; ii) pursue collaboration and exchange with the other nodes; iii) initiate and participate in workshops and general meetings, and when the opportunity presented itself, help organize COPEH participation in international events; iv) support Ecohealth

³ Since Latin America and the Caribbean is composed of a large number of countries, each node worked regionally on translating Ecohealth research into policy (see CoPEH-LAC final report). Here we focus on our collaboration in pan-American organizations.

research projects through student exchanges, seeking funding and helping with publications; v) serve as a bridge between COPEH-Canada and CoPEH-LAC; and vi) lead the social network analysis evaluation of CoPEH-LAC.

METHODOLOGY

In his description of Communities of Practice, Wenger⁴ notes that *“in pursuing their interest in their domain, members engage in joint activities and discussions, help each other, and share information. They build relationships that enable them to learn from each other.”* The overall methodology used by CoPEH-LAC is described in the CoPEH-LAC report. In this section on methodology, we describe the methods for CINBIOSE’s role with respect to joint activities, mutual assistance and sharing to attain the objectives described above and to further our understanding of Ecohealth approaches.

The CoPEH-LAC structure. The “flower” structure of CoPEH-LAC was designed by the founders of CoPEH-LAC to encourage exchange and promote Ecohealth throughout and in the various LAC regions. It has proved highly successful for accomplishing the objectives of (i) progressively building expertise in Ecohealth that corresponds to regional realities; (ii) strengthening cross-fertilization and south-south collaboration; and (iii) achieving international recognition of Ecohealth in research and policy-making.

Expansion in the second phase took different forms for the LAC nodes and for CINBIOSE. The LAC nodes integrated new members into each of the nodes, consolidating the Ecohealth work and activities in the regional working committees. In contrast, the CINBIOSE node in CoPEH-LAC did not increase its CoPEH-LAC membership, but worked actively to establish and maintain links between CoPEH-LAC and Ecohealth researchers and practitioners throughout Canada through COPEH-Canada. Indeed, CINBIOSE played a leading role in the creation of CoPEH-Canada. As a regional node (Quebec-Acadia-Atlantic) within CoPEH-Canada, Cinbiose has hosted a large variety of activities to which were invited colleagues from CoPEH-LAC. The CINBIOSE node serves as an important bridge between the two COPEHs.

Bilateral flow of knowledge from the North and the South: a hands-on methodology. The methods used here were inspired by those used in participatory teaching and research. Exchanges are initiated based on the existing knowledge of the different groups providing the basis for a new construction. In Ecohealth, where understanding the complex pathways between environmental degradation and human health and the factors that influence these pathways is tantamount to success of both research and intervention, this methodology is key to success. Throughout the three years, CINBIOSE members actively participated in regional and transversal field-building workshops that supported specific research projects that were integrating an Ecohealth approach into their work, or on specific topics, such as social communication network analysis in Ecohealth research and intervention or an Ecohealth framework for studying human health outcomes. CINBIOSE likewise facilitated collaboration on curriculum development in Ecohealth between CoPEH-Can and CoPEH-LAC, each learning from the experiences of the other.

Further **knowledge exchange** was achieved through the courses on methodological issues and statistical analyses in Ecohealth research organized and provided by Aline Philibert of CINBIOSE, which included several research teams from CoPEH-LAC. Her exchanges with members of CoPEH-LAC, as well as with other researchers from low and middle income countries involved in IDRC funded Ecohealth projects, fuelled her thinking on methodology leading to her proposal of an iterative cognitive learning process for Ecohealth projects (to be published). As

⁴ Wenger E, 2006 <http://www.ewenger.com/theory/>

members of CoPEH-LAC, CINBIOSE researchers (Johanne Saint-Charles and Marie-Eve Rioux Pelletier) also actively participated in the Ecohealth Field Building Leadership Initiative for Vector-Borne Diseases in Latin America and Caribbean. Knowledge exchange likewise took place at the transversal activities, such as the working group on an ecosystem approach to metals.

Participation in LAC research projects constituted a further method to further Ecohealth practices. CINBIOSE researchers are involved in several major research projects in different regions of LAC and have helped to transform North-South collaborations into South-South-North cooperation.

As a method to further North-South collaboration, **CINBIOSE played a key role in bringing Canadian and LAC students, researchers and professionals in Ecohealth** together to learn from one another. For example, CoPEH-LAC members were invited to share their knowledge with participants in the Ecohealth courses offered by COPEH-Canada in Montreal in 2010, in Prince-Georges in 2011 and in Moncton in 2012 as well as in a Global Health summer school in 2010. Their presence gave rise to very fruitful exchanges. The Moncton course, which included a pre-course workshop with community groups working in the area of children's environmental health, was rich in alternative hands-on learning techniques, particularly appropriate for Ecohealth teaching, which were unfamiliar to CoPEH-LAC members. To further promote bilateral flow on knowledge, CINBIOSE students and researchers have actively participated in projects organized by CoPEH-LAC members.

Transversal activities took on different forms: i) **General meetings**, which constitute a means to establish new relationships and collectively advance Ecohealth concepts and practice. CINBIOSE's role in the first phase was very hands-on, supporting our LAC colleagues in the logistics and organization of the meetings. In this second phase, the host nodes carried out all of the logistical organization and CINBIOSE participated in the exchanges and debates; and ii) **Transversal workshops**, which provide a further forum for sharing and building Ecohealth research and intervention in CoPEH-LAC (see CoPEH-LAC report). CINBIOSE members played an active role in several transversal groups: Social communication network analysis, Metals, Concepts in Ecohealth, Curriculum Development.

From research to policy: The method adopted by CINBIOSE to help translate Ecohealth research into policy in Latin America and the Caribbean was through our work as a World Health Organization and Pan-American Health Organization Collaborating Centre (WHO-PAHO CC) for the prevention of environmental and work related illnesses. There are several WHO-PAHO CC's in CoPEH-LAC and we concerted our efforts to ensure that Ecosystem approaches to health was included in PAHO's strategic objectives for environmental health. CINBIOSE's status as a WHO-PAHO CC was renewed in December 2012 for 4 years.

Evaluation: In this second phase of CoPEH-LAC, CINBIOSE continued to lead the longitudinal social communication network analysis that was initiated at the onset of our COPEH to follow the evolution and strength of the collaborative relationships between CoPEH-LAC members. A community of practice is a network of people and its sustainability is dependent upon the relationships created and developed between participants. In that sense, the network analysis framework and methodology constitutes a relevant choice for the analysis of the growth and development of the community of practice. The quantitative and qualitative analysis allows us to measure and evaluate community growth; the evolution of exchanges between all participants of CoPEH-LAC but more so between participants in Latin America and the Caribbean; the unfolding of horizontal communication; the evolution of the diversity of the participants in terms of their roles (investigators, policy makers, participants of civil associations), their institutional attachment, their gender, their status and their disciplines of training and of actual practice. It provides us the means to understand the conditions that have contributed to CoPEH-LAC successes, the needs of the participants, and the strengths and complementarities. It also provides feedback to the

participants of the community. It should be noted that neither part of our evaluation process (quantitative or qualitative) “asks people to express their appreciation.” The quantitative (social network) part of the evaluation measures the growth and resilience of the community through the identification of the type of relationships between people. The qualitative study aimed at a deeper and better understanding of the contribution of the CoP to this growth and to the development of relationship and project (see Appendix I).

PROJECT ACTIVITIES

In its second-phase role, CINBIOSE’s activities within CoPEH-LAC were conducted primarily as a response to the needs expressed by the LAC counterparts and as a broker between CoPEH-Canada and CoPEH-LAC. The node members also continued to promote EAH in their own work through various activities such as thesis supervision, publications and communications. Here we focus only on the former since the CoPEH-LAC final report shows some of the outputs of the latter. Also, many “local” activities were linked with CoPEH-Canada and, as such, are reported there (see *CoPEH-Canada* final report).

The main activities can be classified as follows:

- **Participation in CoPEH-LAC’s Coordinating Committee (CCC):**
 - Donna Mergler (co-PI) and Johanne Saint-Charles participated actively in CoPEH-LACs CCC, attending face-to-face meetings, as well as monthly web-based meetings. Donna Mergler, as co-PI worked with Berna van Wendel (co-PI) on planning activities and writing reports. She spent several weeks at the Universidad Nacional over the 3-year period. Johanne Saint-Charles participated in the committee for the systematization of CoPEH-LAC activities and outputs. Marie Eve Rioux-Pelletier and Mélanie Lemire also participated in the organization of the CoPEH-LAC general meeting in Brasilia.
- **Support to transversal activities:**
 - **Metals group:** The objective of this working group is to bring an ecosystem approach to the study of metals in the LAC environment. Donna Mergler, who is part of this group, participated in the meeting held in Montevideo, Uruguay in October 2012. She presented on the concepts for health evaluation within an Ecohealth framework, where examining early alterations in relation to exposures to metals and the biological, social and environmental factors that influence this relationship, can provide the basis for preventive intervention and policy decisions. She likewise presented her work on how to examine sex and gender in studies on metal neurotoxicity, combining her knowledge as a physiologist with that of Julia Medel, a sociologist. This workshop was particularly rich and the on-going projects from Argentina, Peru, Ecuador, Brazil and Mexico have made important inroads in integrating Ecohealth concepts into their research and intervention (for a summary of the workshop, see CoPEH-LAC report)
 - **Social Network Analysis:** This involved the design of a training program, including the development of pedagogical material in collaboration with Frédéric Mertens and Renata Tavora of the Brazilian node. Eight groups from four nodes in CoPEH-LAC participated in this program which was comprised of three sessions held in Costa-Rica, Peru and Panamá, and of individual supervision between the sessions. This resulted in the integration of social network analysis in 7 studies in ecosystem approaches and in 8 proposals for papers (7 based on research and one theoretical paper). The list of the papers is provided in Annex II. These papers are now being written with the collaboration of the training team. All of the groups have submitted an outline of their paper and a deadline for the submission of a first draft to the training team.

- **Vector-borne Diseases:** Johanne Saint-Charles and Marie Eve Rioux-Pelletier in collaboration with Frédéric Mertens and Renata Tavora are members of the “monitoring and evaluation” team of the *Iniciativa sobre Liderazgo y Desarrollo del Campo de Ecosalud y Enfermedades Transmitidas por Vectores (ETV’s) en América Latina y el Caribe*. They are responsible for the social and sociosemantic network analysis.
 - **Ecohealth Concepts:** Donna Mergler is collaborating on the writing of a chapter on Epidemiology in Ecohealth with Horacio Riojas and Berna van Wendel. She will also write a prologue with Berna van Wendel. Johanne Saint-Charles and Marie Eve Rioux-Pelletier, with Anita Lujan, are writing a chapter on “Communities of Practice and Ecohealth.” Aline Philibert is writing a chapter on the Cognitive Iterative Process in Ecohealth Research.
 - **Curriculum development.** Jena Webb and Marie-Ève Brodeur participated in various meetings and contributed to the systematization of the available materials on the intranet.
- **Support to Ecohealth research projects: CINBIOSE researchers participated in several Ecohealth projects initiated by CoPEH-LAC researchers.**
 - **An Ecohealth Approach to Pesticides in Costa Rica:** Several CINBIOSE researchers (Donna Mergler, Johanne Saint-Charles, Marie-Ève Rioux Pelletier) have been involved in the research projects funded by IDRC in the provinces of Talamanca and Matina. As part of her master thesis, Marie Eve Rioux-Pelletier (supervised by Johanne Saint-Charles) used mixed-methods (combining social network analysis and text analysis) to explore the diffusion of prevention practices related to the use of pesticides. Johanne Saint-Charles has played an advisory role for the social sciences aspect of the project through support of Douglas Barraza’s thesis. Donna Mergler is actively participating in the *Infantes y Salud Ambiental* (ISA) birth cohort study in Matina. She obtained funds from Health Canada in 2011-2012 to include manganese exposure from the pesticide mancozeb’s pathways of exposure and effects. She was instrumental in putting the Costa Rican researchers in contact with others worldwide who are interested in this issue. She is participating in data analysis and article writing. A proposal to follow-up the children at 3-years of age was submitted to CIHR in March, 2013.
 - **Manganese exposure in Latin America:** Several CoPEH-LAC researchers are working on the effects of manganese exposure on children’s development.
 - The team in Mexico, lead by Horacio Riojas, adopted a very successful Ecohealth approach to examining the complex pathways between the environmental sources of airborne manganese, social and health aspects and succeeded in bringing about important changes in policy and exposure. Donna Mergler played an important advisory role on this project, with respect to study design, methodology and article writing.
 - Antonio Menezes⁵, head of the Analytical Toxicology Laboratory in Salvador de Bahia, Brazil, and an active CoPEH-LAC member of the Brazilian node, is studying manganese exposure and its effects on children and adults living near a manganese alloy transformation plant. Donna Mergler became his tutor as part of the scholarship that he received from Mount Sinai Medical School in New York. His initial project did not use an

⁵ Antonio Menezes received a doctoral scholarship from Mount Sinai Medical School and at the request of Luz Claudio, the program chair, Donna Mergler became his tutor. He received his doctorate in 2009 and is currently a very active member of CoPEH-LAC.

Ecohealth approach, but under the guidance of Donna Mergler, he became a member of CoPEH-LAC, incorporated an Ecohealth approach into his project, was able to meet with other Latin American researchers interested in manganese and is now involved in a multi-centre study on manganese exposure from the pesticide mancozeb, using an Ecohealth approach.

- Berna van Wendel from Costa Rica has now included manganese exposure from the pesticide mancozeb, using an Ecohealth framework for her project, financed by IDRC and the Swedish FORMA. In 2010, Donna Mergler obtained a CIHR planning grant to bring researchers from these projects to the Neurotoxicology Meeting in Portland, Oregon. We set up an international collaboration on the study of manganese in children using an Ecohealth approach.
- **Neurotoxicity.** Pollution from neurotoxic substances abounds in Latin America and the Caribbean from different metals (including lead which has been almost eliminated in North America), pesticides and emerging chemicals. Evaluation of early neurotoxic effects of exposure fits well into the Ecohealth framework since it provides the possibility of assessing neurophysiologic and neuropsychologic changes at a moment when they still may be reversible by reducing exposures or using cognitive stimulation. The social-biological interaction is particularly pertinent for neural damage and the cycle of poverty is greatly affected by reduced intellectual capacities. Funds were obtained from CIHR by Donna Mergler to organize an international workshop to develop a neurobehavioral battery for studies in LAC. This workshop was a catalyst to further workshops organized by Latin American CoPEH-LAC members and setting up South-South collaboration to include neurotoxic effects as a health outcome in Ecohealth studies. David Hernandez from the Mexican National Institute for Public Health (INSP) and co-coordinator of the Mexican node, has been instrumental in these efforts. He likewise organized an INSP summer course in 2012 on assessment of neurotoxic effects; Donna Mergler was an invited speaker and several CoPEH-LAC members received scholarships to attend.
- **Support for Study Design and Statistics.** The Canadian node of CoPEH-LAC contributed funds to the IDRC project lead by Aline Philibert: *Relever le défi analytique intégrer des études en écosystèmes et santé*. Courses on study design and statistical analyses were given to COPAEH-LAC researchers.
- **Poor land use, poor health (PLUPH).** Johanne Saint-Charles in collaboration with Frédéric Mertens of the Brazilian has set up a “social sciences group” to support the inclusion of social sciences in the thesis of 4 students in the *Poor land use, poor health (PLUPH)* project related to deforestation in the Amazon and its impact on health.
- **Human exposure to lead.** Myriam Fillion is participating in a research project, based at the *Centro de Desenvolvimento Sustentavel (CDS)* of the University of Brasilia, which will study human exposure to lead, and explore environmental sources and routes of exposure to this metal in non urban populations of Brazilian Amazon, using an ecosystem approach to human health. The project proposes to develop risk maps, improve epidemiological surveillance and integrated strategies to reduce exposure.
- **Climate change.** In collaboration with colleagues of the Brazilian node, a letter of intent was submitted and accepted for The International Research Initiative on Adaptation to Climate Change for a project called *Adaptation to Climate Change as an Opportunity for Regional Development program (ACCORD)*. The full project did not meet with financial success but the collaboration developed during this project is still under way. A paper has been published

(conference proceeding), a student of J. Saint-Charles is doing her master thesis in the context of this collaboration and another paper is in preparation (see Appendix II).

- **Support to policy and practice** – Since CINBIOSE is not situated within a LAC country, our efforts for transferring research into policy and practice were through international organizations, such as the World Health Organization and the Pan-American Health Organization. CINBIOSE was one of the three CoPEH-LAC WHO-PAHO Collaborating Centers represented at the meeting at the United States National Institute for Environmental Health (NIEHS) in South Carolina on October 24-26, 2011. We concerted our efforts to include ecosystem approaches to human health as part of the PAHO agenda. Following the meeting we continued to work with PAHO representatives to further their understanding of Ecohealth approaches. In collaboration with LAC colleagues, CINBIOSE is preparing a course for PAHO personnel on Ecohealth. There is growing awareness in international health organizations of the importance of adopting a more global trans-disciplinary approach to the growing burden of non-communicable disease, which has surpassed communicable diseases, even in developing countries.
- **Broker role**
 - **CoPEH-Canada courses.** Starting with the course that was organised at UQAM in 2010, we have invited colleagues from the LAC region to contribute to the course as trainers. In 2010, Óscar Betancourt (nodo Andino), Jean-Remy Guimarães and Carlos Jose Passos (nodo Brazil) were invited; in 2011 (Prince-Georges), Carlos Passos (nodo Brazil) participated in the course; in 2012 (Moncton), Berna van Wendel (nodo ACC) and Ernesto Raez-Luna (nodo Andino) participated in the course and in the workshop *Improving children's health through ecosystem approaches to health*. Antonio Menezes (nodo Brazil) also participated as a student in the course. It is of note that our colleague from CoPES-AOC Benjamin Fayome also participated in the workshop and the course which contributed to the development of a collaboration between the three CoPs.
 - **CoPEH-Canada “EcoHealth in Canada workshops series.”** Janine Ramsey (nodo Mexico) participated in the June 2011 (see *CoPEH-Canada final report*) workshop. She also participated in a workshop on epidemiology organised by the CIHR Team in Gender, environment and health for which CINBIOSE (the Center) is responsible.
 - **Teaching manual and workshop.** Johanne Saint-Charles and Jena Webb, along with Suzanne McCullagh of the CoPEH-Canada, have actively contributed to establish the connection between the CoPEH-Canada teaching manual and the curriculum development activities in CoPEH-LAC. In November 2011, an “International Teaching Manual meeting” was held in Montreal with the participation of many LAC colleagues.
 - **EcoHealth2012 pre-conference field building meeting.** Johanne Saint-Charles and Jena Webb drafted a successful proposal to host a half-day workshop on fieldbuilding prior to the EcoHealth 2012 conference in Kunming, receiving additional funding from the IDRC for this activity. Twelve people from Latin America, three of whom are on the CCC of the CoPEH-LAC, participated in the workshop activities and Berna van Wendel also helped with the organization of this workshop. The workshop report indicates several areas of interest that the 105 participants have for the future of the field of EcoHealth; we are considering turning this report into a paper.
 - **EcoHealth 2014.** CINBIOSE (the center) and CoPEH-Canada will be co-hosting the EcoHealth 2014 Conference (International Association for Ecology and Health). Representatives of CoPEH-LAC have been invited to join the steering committee of the conference.

RESSOURCES

The financial resources for CINBIOSE within CoPEH-LAC served to pay for personnel, including students from the Department of Public and Social Communication, who worked on the social network analyses under the supervision of Johanne Saint-Charles and Marie-Ève Rioux Pelletier and Research Assistants, Marie-Ève Rioux Pelletier, Jena Webb and Marie-Ève Brodeur, as well as Denise Murzeau for administrative assistance (see budget report). Resources were likewise used to pay travel expenses for the researchers and for personnel. Compared to the initial budget, we spent more money on personnel and less on travel expenses since we were able to obtain travel funds from other sources.

KEY RESEARCH RESULTS

We have grouped our key research results according to the strategic objectives of CoPEH-LAC (see CoPEH-LAC final report) focusing on the roles of the CINBIOSE node in support and as broker. For details see Appendix II.

DEVELOPMENT OF KNOWLEDGE AND CAPACITY

R1. Training and capacity building

- Training of eight groups of people from four nodes in the integration of social network analysis in ecohealth research projects
 - 8 PowerPoint presentations in Spanish
 - 3 workshops
 - a list of relevant references
- Training of persons interested in integrating an ecosystem approach into their work on exposure and effects of metals (workshop held in Montevideo, October 2011)
- Invitation of CoPEH-LAC researchers as trainers in 4 summer schools in Canada;
- Invitation of CoPEH-LAC researchers to an interdisciplinary workshop in Mn neurotoxicity;
- Mentoring of 4 doctoral students in the LAC region;
- Systematization of available materials and activities for Curriculum Development
- Mentoring through active involvement in research projects as well as article and grant writing activities.

R2. Dissemination

- Seventeen (17) scientific publications in collaboration with CoPEH-LAC members; 2 scientific publications submitted; 14 in preparation;
- Scientific communications and posters in collaboration with CoPEH-LAC members;
- Many conferences (as keynote speakers, invited speakers, session speakers, seminars) on Ecohealth approaches with a focus on our work in Latin America);
- One book chapter and 3 in progress.

R3. Social, academic and political alliances

- Advancement of the ecohealth framework with WHO / PAHO;
- One field building workshop at EcoHealth 2012;
- Meeting with the Secretariat of the Convention on Biological Diversity;
- Development of collaboration between CoPEH-LAC and the Centre interdisciplinaire de recherche en développement international et société (CIRDIS);
- Facilitating the development of collaboration between CoPEH-LAC and CoPEH-AOC;
- Contributing to the convention between CoPEH-LAC and IRD.
- Participation in IRD-organized activities

DEVELOPMENT OF COPEH-LAC

R4 – Consolidation of CoPEH-LAC

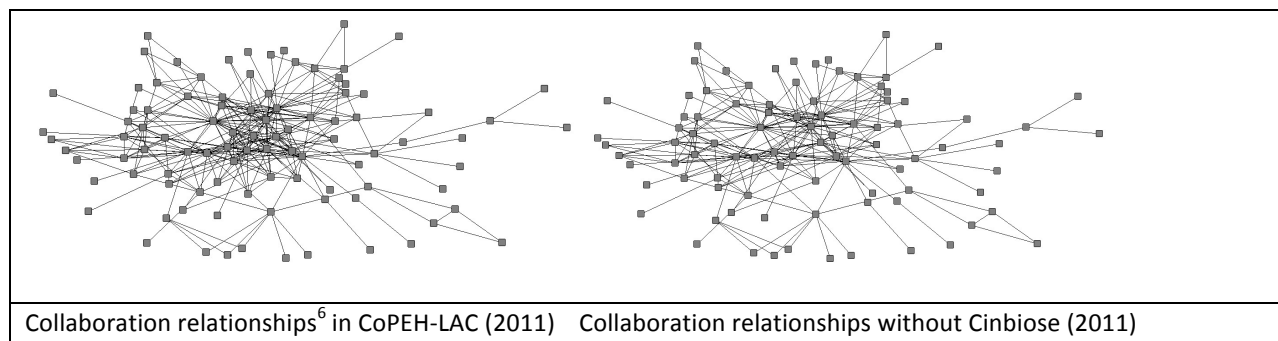
- Realisation and diffusion to the members of the social and socio-semantic evaluation of CoPEH-LAC.
- Bringing together researchers from the different nodes to work on collaborative projects
- Participation in transversal activities

R5 - Resource mobilization

- Facilitating access to resources in the North. It is difficult to quantify the benefits from having access to the resources in the North or the number of times that COPEH facilitated this access to resources such as computer programs, scientific articles, scientific equipment, networking with international researchers.
- Collaboration on 8 grant applications (see Appendix II)

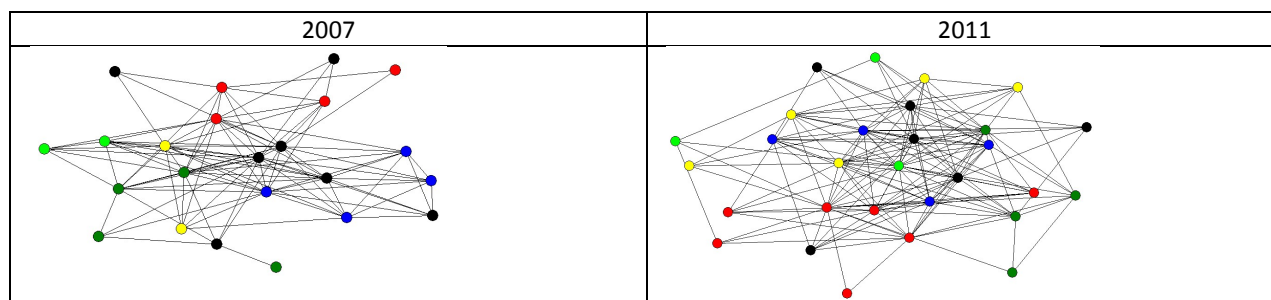
MODELS

In the CoPEH-LAC report, it is clear that CoPEH-LAC has served as a model for promoting Ecohealth approaches within LAC and worldwide. Its structure, based on regional autonomy, with strong transversal links served to strengthen regional ties as well as foster South-South collaboration. These regional and transversal links are well illustrated in the longitudinal social communication network analysis (Appendix I). A further model is that of CINBIOSE's integration and role within CoPEH-LAC. Results from the longitudinal social communication network analysis are revealing: The following figures show that despite the fact that the CINBIOSE node still plays a central role in the community, by 2011, the community's resilience no longer depended on CINBIOSE.



Moreover, between 2007 and 2011, CINBIOSE increased its collaboration with members of the other nodes.

⁶ See Appendix I for definitions. Collaborative link: *I have developed professional activities, such as: collaboration on a research project, an intervention, the organization of an event or course, a work project, the co-direction of a student or co-authorship of a publication with this person.*



Cinbiose : black; ACC : red; Brazil : blue; Mexico : light green; Cono Sur : yellow; Andino : dark green

PROJECT OUTPUTS AND DEVELOPMENT OUTCOMES

Appendix II lists the outputs related to the work of the CINBIOSE node in CoPEH-LAC. The list is not exhaustive and is used mostly to illustrate the role of Cinbiose node in CoPEH-LAC, since this information is also part of the CoPEH-LAC global final report. In what follows, we discuss the project outputs and development outcomes related to the CINBIOSE nodal support and brokering roles in CoPEH-LAC in terms of issues and lessons learned.

SOUTH-NORTH TRANSFER

As stated earlier, it was one of CINBIOSE's challenges to foster links and partnerships between people, organizations and regions of LAC while providing the space for the LAC partners to lead these initiatives. As is shown by the social network analysis and throughout the CoPEH-LAC final report, this has been achieved above and beyond expectations. South-south collaboration within CoPEH-LAC has grown tremendously and outputs in terms of co-organised workshops, joint publications, grant applications and communications reflect this. Through this enhanced collaboration, an important outcome is "south-north transfer." Indeed, as our LAC colleagues began to tap "internally" into their own expertise, they were also in a better position to share it with Canadian colleagues. In all of our activities within CoPEH-LAC we have learned from our LAC colleagues and have passed on this knowledge to our students and colleagues. It has fashioned the way in which we do research and intervention. Some concrete examples of South-North transfer are provided here:

- Because of the success of the CoPEH-LAC structure, which roots Ecohealth activities in regional realities, CoPEH-Canada adopted a similar structure with three nodes covering the wide breadth of Canadian realities.
- Two researchers (Mélanie Lemire and Myriam Fillion) who were trained in the LAC context through their doctoral research and were active members of CoPEH-LAC, are now doing research with indigenous communities in the North of Canada using ecosystem approaches, greatly influenced by their studies in the "south."
- Six visiting professors from CoPEH-LAC participated in three of the CoPEH-Canada courses (2010, Montreal; 2011 Prince George; 2012 Moncton).
- Organization of joint courses and workshops at international meetings (e.g. EcoHealth 2012 in Kunming; *Contaminación por metales: impacto sobre el ambiente, la salud y la sociedad* (with the French *l'Institut de recherche pour le développement* (IRD) and colleagues from the Andean node, 2010 in Oruro.

ADVANCING ECOHEALTH APPROACHES THROUGH RESEARCH

In terms of outputs, the CINBIOSE node's work in research has contributed to the development of research projects and to scientific outputs such as scientific articles and communications (see CoPEH-LAC global final

report). Most joint publications are in English and a challenge would be to publish more in Spanish, Portuguese or French.

Development outcomes are related to learning to “understand, act upon and communicate about” complexity. As we will see below, steps were made in that direction in CoPEH-LAC. The learning we did and the challenges we faced contributed to the development of the next stage of collaboration with CoPEH-Canada as expressed in the grant application made to IDRC by the two communities of practice. Here we briefly describe some of the collaborative research that helped advance ecohealth approaches.

Mercury contamination in the Brazilian Amazon: Over the past three years, the important contribution of our work in this ecosystem approaches to human health project is the consideration of not only the complex relations between mercury exposure sources, transmission and effects, but also the social, agricultural and biological factors that serve to provide fish-eating communities with the means to continue to eat fish, which are very nourishing and promote health, and reduce exposure and its harmful effects by knowing how other foods in the traditional diet interact with mercury and health outcomes. These studies include Brazilian and Canadian researchers and graduate students who were active in CoPEH-LAC.

Pesticide use and its effect. We have collaborated on the research being carried out by the team in Costa Rica who is using an ecosystem approach to examine pesticide use and its effects in indigenous and non-indigenous communities. The contribution of CINBIOSE researchers and students focused on both the social and the health aspects of pesticide exposure, reinforcing the team’s capacities in different areas. To help support this research, we received a grant of \$70,000 CAN from Health Canada. We are currently submitting an application to CIHR to examine the role of manganese exposure in the birth cohort study lead by Berna van Wendell de Joode. The participation of Berna van Wendell de Joode in the workshop organized by the QAA node of CoPEH-Canada with community groups working in the area of children’s environmental health, has lead to the building of a new collaboration between the project in Costa Rica and a project on manganese in New-Brunswick conducted by QAA node researchers of CoPEH-Canada.

Manganese exposure: We have collaborated on a number of projects on manganese exposure in children, bringing our expertise to the table and bringing together LAC researchers in the area. We have learned from the ecosystem approach used by our Mexican colleagues in a region with manganese mining, where they successfully combined research from the social, natural and health sciences to identify the complex pathways of exposure and effects and worked with stakeholders and decision-makers, including the mining company and governmental agencies to bring about changes. We, and our Mexican colleagues, had important input into the project in Brazil, which, at its inception, was not using an ecosystem approach. We brought together the Mexican and Brazilian scientists with researchers in Costa Rica who in their ecosystem approach to pesticide exposure in communities living near banana plantations are now including pathways and effects of manganese exposure from the fungicide mancozeb. This the first study to examine the pathways of manganese exposure from aerial spraying of mancozeb in banana plantations. It is noteworthy that mancozeb is extensively used throughout the world. The results of this latter project will serve to revisit the regulations governing mancozeb use in agriculture worldwide.

Community dissemination: Canadian researchers and graduate students participated in community meetings to return the results of their studies to local populations and in the production of materials for communities. These materials presented comprehensive, ecosystem approaches in an accessible language.

Sex and gender: Another important issue in the development of the ecosystem approach is that of the analysis of sex and gender in research and intervention. CINBIOSE’s role on this topic is reflected in the papers published specifically on this issue in collaboration with our LAC colleagues (see Appendix II) and in the projects conducted in

collaboration with the *Centro de Estudio de la Mujer* (nodo Cono Sur). CINBIOSE (the Center) is the leader of the CIHR Team on Gender, Environment and Health a pan-Canadian team in environmental and occupational health (<http://www.geh.ges.ugam.ca>) and as such researchers from the CINBIOSE have contributed to developing new methodologies for analyzing gender and sex, using mixed methods, quantitative methods for large data banks and in policy-making, which we have shared with our LAC colleagues.

CONSOLIDATE SOCIAL, ACADEMIC AND POLITICAL RELATIONSHIPS

The social network analysis presented in the CoPEH-LAC report describes the evolution of the different types of relationships within CoPEH-LAC, here we focus on academic and political relations that were advanced by CINBIOSE's presence in CoPEH-LAC.

- CINBIOSE, like IRET and INSP, is a WHO-PAHO Collaborating Centre. In CINBIOSE's last renewal as a collaborating center, Ecosystem approaches to human health was specifically mentioned in our terms of reference as a Collaborating Centre. The CoPEH-LAC WHO-PAHO Collaborating Centres worked together to have Ecohealth approaches included in the PAHO strategic plan. CINBIOSE is currently working on the design of a course outline for PAHO personnel. In terms of outcomes, PAHO plays an important political role in health policies throughout the Americas and particularly in Latin America. This has been an important break-through in transferring Ecohealth approaches into policy.
- CINBIOSE is located at the *Université du Québec à Montréal*, and as such maintains links with the French-speaking world and with Francophone organizations. CINBIOSE played an important role in the recent agreement signed between FUNSAD (as a representative of CoPEH-LAC) and the French *Institut de recherche pour le développement* (IRD). IRD researchers are adopting Ecohealth approaches to their work in the Andean region and Donna Mergler was invited to present Ecosystem Approaches to Human Health at a seminar at the *Université de Montpellier*, organized by professors from IRD. CINBIOSE actively participated in the two colloquia organized by IRD in Bolivia and revised the French version of the agreement between FUNSAD and IRD.

APPLICATION AND INTEGRATION OF ECOSYSTEM APPROACHES

CINBIOSE played a crucial role in the integration of ecosystem approaches to health in LAC through organizing and participating in workshops, courses and conferences (see CoPEH-LAC report and Appendix II). This participation enriched our thinking on Ecosystem approaches, and contributed to the field.

In each of the projects described in the previous section, inroads were made into advancing ecosystem approaches in our understanding of the complex interaction of physical, social and cultural issues that affect human health. Professors throughout CoPEH-LAC use these as examples in their teaching and capacity building.

One of the challenges of a transdisciplinary community such as CoPEH-LAC is its evaluation. At the onset of CoPEH-LAC, we decided to use social network analysis for part of the internal evaluation. The logic behind this was that one of the challenges faced by researchers and practitioners in ecohealth is to build transdisciplinary collaborations. The first communication network study was a relatively simple one and addressed the development of professional relationships (contact and collaboration) within the community of practice. Qualitative data collection and analysis led us to conclude that there was a need to explore other types of relationships (such as cognitive and personal exchanges) and well as trust. Concurrently, Johanne Saint-Charles and her colleagues started exploring "sociosemantic networks" (see <http://www.groupe-reseaux.ugam.ca/>) i.e. the networks created by similarities and differences between peoples' discourses. This led to a deeper understanding of the development of "transdisciplinary groups" and to many more complex questions in this regard. Answering

those questions proved to be a much bigger methodological challenge than we had anticipated and we have put together a team composed of researchers from CINBIOSE (Johanne Saint-Charles, Pierre Mongeau), CoPEH-Canada (Donald Cole and Margot Parkes) and CoPEH-LAC (Frédéric Mertens and Pierre Girard) to address these challenges. Together, they have written a grant application to the Social Sciences and Humanities Research Council of Canada, which aims at identifying the structural characteristics of social and sociosemantic networks that have an impact on the objectives and resilience of transdisciplinary groups. This work is innovative and judging by the reaction of colleagues when it has been presented in scientific conferences⁷ much needed. Hence, working in such a dynamic and successful community of practice in ecohealth led to innovation in social sciences.

PROJECT IMPACTS

In Latin America and the Caribbean, CoPEH-LAC contributed to the awareness, training and expertise development of numerous people. Starting with the 200 people who have participated in the community, adding to this their research collaborators, the 10 to 20 people in *each* workshop organised by CoPEH-LAC, the numerous students that were reached through the curriculum activity, the presentations made in scientific conferences, the published papers and so on, testify to the impressive outreach of CoPEH-LAC. Without doubt, CoPEH-LAC has ensured the development of the field of ecosystem approaches to health in Latin America and the Caribbean. Not only, this but the influence on organisations such as WHO/PAHO and IRD, both of which have formally acknowledged the relevance of ecohealth, shows that CoPEH-LAC's influence goes beyond the LAC region.

What then would have been the contribution of the CINBIOSE node to this impact? As we have seen with the social network analysis, CINBIOSE was very central at the beginning of this community of practice. In fact, without CINBIOSE, collaborations between LAC researchers tended to remain within the same country. As we said at the beginning of this report, CINBIOSE saw as its challenge to foster links and partnerships between people, organizations and regions of LAC while providing the space for the LAC partners to lead these initiatives. We are proud to have succeeded in that endeavour and despite the difference in access to resources that still exists between LAC and Canada; from instigator, CINBIOSE became “one of the nodes.”

YOUR PROJECT'S ECOHEALTH STORY

Our story is one of international collaboration emerging through shared values. It is also a story of the acknowledgment and sharing of regional expertise and experiences. Finally, it is a story of empowerment and of distributed leadership.

When CINBIOSE researchers started to work with their colleagues in LAC, their relationships were seeded in a fertile ground of common values, which eventually bloomed into the “ecosystem approaches to health” tree. When the call for the building of a community of practice came out in 2004, after the EcoHealth conference that was held in Montreal, Donna Mergler of CINBIOSE contacted her LAC colleagues that were susceptible to adopt and further develop ecosystem approaches. The soil of common values being there, it was easy for them to acknowledge the strong and specific expertise each group has developed and to create a community based on these strengths and on the potential for cross-fertilisation.

We are proud to have participated in this endeavour, which has successfully put Ecohealth approaches on the map in LAC. CoPEH-LAC is solidly grounded in the five regions of LAC and is continuing to expand through teaching

⁷ Based such presentations, Johanne Saint-Charles just received an invitation to present her work in Russia.

programs, research projects and policy intervention. The deep connexion between the Cinbiose node and the LAC nodes based on many years of shared collaboration and knowledge exchanges contributed to the building of strong international collaboration much needed in a globalized world where emergent problems at the interface of health, the environment and society transcend frontiers.

OVERALL ASSESSMENT AND RECOMMENDATIONS

The achievements described above cannot occur without great investment in time and resources. But, in our opinion, it was worth it. From a strictly financial point of view, the members of CoPEH-LAC have been creative in their use of money managing to achieve more with less money, for example holding meetings at the same time as professional conferences that people are attending from other budgets. Our presence in CoPEH-LAC expanded our horizons and given rise to collaborative research projects in many countries of the Americas. Our role as a WHO-PAHO Collaborating Centre lead to new avenues for links with policy-makers

On the substantive side, attaining the project's objectives led to a variety of upcoming initiatives, for example, grant applications already submitted to SSHRC, IDRC, CIHR and the Mexican Embassy, further network analysis to pursue, and papers to write about our findings. This project also led to new and prosperous partnerships, such as those between CoPEH-Canada and other CoPEHs

In terms of recommendations, our primary proposal is that in future grant of this nature – where part of the grant money is going to one organization and part is going to another even though the two are working on the same project – that only one technical report be submitted. First, there is necessarily redundancy in this situation, since we at CINBIOSE are working toward the same objectives and on the same activities as those in LAC. Second, those of us who worked on this report could have invested more of our time into the primary report or into writing articles.

We congratulate IDRC on initiating the program of Communities of Practice and we hope that we have made a long-lasting contribution to the field of Ecohealth in Latin America and the Caribbean.

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Contact Information of Researcher/Research Team members: Donna Megler, Johanne Saint-Charles

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Abstract: *Research outputs should include an abstract of 150-200 words specifying the issue under investigation, the methodology, major findings, and overall impact.*

This final report is concerned with the role played by the CINBIOSE node in the Community of Practice in Ecosystem Approaches to Human Health: Latin America and the Caribbean and should be seen as a complement of the final report of this Community. This role primarily involved (i) support to workshops and training in Ecohealth approaches organized in LAC; (ii) collaboration on research projects based on ecosystem approaches to health; (iii) brokering between our LAC and Canadian colleagues; (iv) concerting our efforts with other COPEH WHO-PAHO Collaborating Centres to have ecosystem approaches to health put forward in PAHO strategic programs in environmental and occupational health. CINBIOSE's work within CoPEH-LAC allowed us to better develop our approaches to the study of the complex pathways between ecosystems, health and society. We learned about the diversity of ecosystems and the socio-politico-cultural traditions and realities in LAC regions. We widened our collaborations in LAC and enriched our own research and understanding of the links between research and policy-making, and passed this knowledge to our Canadian students and colleagues. In the end, our collaboration evolved into a Pan-American partnership for the strengthening of research, policy and practice at the intersection of health, ecosystems and society.

Keywords: Community of Practice, EcoHealth, Latin America, Environmental Health, Occupational Health, Gender, Equity

FINAL TECHNICAL REPORT FOR THE CINBIOSE NODE OF THE COMMUNITY OF PRACTICE IN ECOSYSTEM APPROACHES TO HUMAN HEALTH: LATIN AMERICA AND THE CARIBBEAN APPENDIX I: SOCIAL NETWORK ANALYSIS OF COPEH-LAC

IDRC Project Number-Component Number: 105151-002

Subtitle: Community of practice in ecohealth – dissemination and institutionalization for research, outreach and policy influence in Latin America and the Caribbean

By: Johanne Saint-Charles and Marie Eve Rioux-Pelletier

Period covered by the report: *June 2009– February 2013*

Date of submission: February 15, 2013

Country/Region: Canada and Latin America and the Caribbean

Full Name of Research Institution: *Centre interdisciplinaire de recherche sur la biologie, la santé, la société et l'environnement (CINBIOSE), Université du Québec à Montréal*

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Johanne Saint-Charles and Marie Eve Rioux-Pelletier¹

Introduction

Since the first apparitions of the expression “community of practice” (Brown et Duguid, 1991; Lave et Wenger, 1991) the concept and its real-life applications have been widely used and analyzed. The definition proposed by Wenger of a community of practice suits well what CoPEH-LAC is and is doing:

Communities of practice are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly (Wenger, 2007).

More than a simple summation of members, a community of practice emerges from the interactions between its members. The patterns formed by the various types of relationships between members allow for the creation of a resilient network, which can sustain knowledge creation and exchange. In other words, a community of practice is a network of people and its sustainability is dependant upon the relationships created and developed between participants. In that sense, network analysis framework and methodology is a relevant choice for the analysis of the growth and development of a community of practice.

In order to capture these patterns and their evolution, a communication network analysis was planned in CoPEH-LAC at the onset of the program. Johanne Saint-Charles and Marie Eve Rioux-Pelletier conducted this analysis, with contributions from Frédéric Mertens and Renata Távora from the Brazilian node. Here we present a few highlights of this study.

In this appendix, we will show how the community of practice has evolved, first retracing, in broad strokes, the steps from the beginning of phase 1 to its completion (more detail of this phase can be found in van Wendel de Joode et al, 2009 and 2010); then presenting in more detail the results of the social network analysis of the second phase and concluding with the challenges and future steps.

Objectives

The objective of using social network analysis was to monitor the growth and expansion of the community in order to be able to measure the increase of various types of relationships and the development of intersectoral, internodal and interdisciplinary relationships. It aimed also at evaluating the robustness of the network and the extent of member diversity. In that sense, it contributes to the evaluation of the “strategic” objective of developing the community of practice.

Method

For the study of the network and the development of CoPEH-LAC², we used mixed methods:

¹ We wish to thank our colleagues Frédéric Mertens and Renata Távora of the Brazilian node for their contributions to the design of the questionnaires. Frédéric also contributed to the data analysis in Phase 1. As well our colleague Pierre Mongeau from Cinbiose who has contributed to the data analysis in Phase 2.

² In Phase 1, CoPEH-LAC was called CoPEH-TLAC. Here we use only one name for the sake of clarity.

- quantitative: sociometric questionnaires³ to map different types of relationships between CoPEH-LAC members;
- qualitative: open-ended questions to better understand the different aspects related to the evolution of CoPEH-LAC.

The longitudinal study of the CoPEH-LAC network comprises three data collection times. In order to have a basis of comparison, a first questionnaire was sent in 2006 (T0) asking the initial 16 participants of the community (the coordinating group) about their collaboration and contact relationships with one another and collaborators they thought would become CoPEH-LAC participants.

In 2007, a second questionnaire (T1) was sent to the members of the coordinating group and the working committees (N=118). In addition to the questions asked in the first questionnaire, respondents were asked to identify participants of CoPEH-LAC whom they met through the community of practice and with whom the participation in CoPEH-LAC led to an improvement in their professional relationship.

An analysis of the open-ended questions and interviews conducted in Phase 1 prompted us to create questions about other types of relationships and about trust to add to the Phase 2 questionnaire sent in 2011 (T2) to members of the coordinating group, working committees and also to the collaborating members of CoPEH-LAC (N=120).

Prior to sending each questionnaire, the questions it included were discussed with the coordinating committee to insure their relevance and the appropriateness of their wording. A roster was created based on the lists of participants sent by the nodal coordinators – a practice that reflects the autonomy of each node.

The 2007 questionnaire was constructed online using *Survey Monkey*. Unfortunately, this application is poorly suited to gather relational data and resulted in many weeks spent on “formatting” the data. We therefore sought a more appropriate application. A program called *Sémato* developed at UQAM offered greater possibility for semantic analysis (see “Next steps”) and for gathering survey data. The creator of the program offered to construct a special module for social network data gathering and we worked with him to create this module, which is now available to us for a small price each time we wish to realize a new project. This investment in time (for the construction of the module) was worthwhile since it notably reduced the time needed for data formatting. This program is also now being used for the monitoring of the network in *Proyecto liderazgo en ecosalud para las enfermedades transmitidas por vectores (ETV)*. Nonetheless, some of CoPEH-LAC participants do not have easy access to Internet and, for them, we have devised an *Excel* worksheet to gather the data which we format afterwards and include with the others.

Data Analyses

Numerous measures have been developed over the years by Social Network Analysts (e.g. Carrington et al., Wasserman et Faust, 1994) and most have been captured in computer programs designed for this purpose. To analyse our data, we used *UCINET* and *NetDraw* (Borgatti, Everett, & Freeman, 2002).

Network data are relational and it means that a relationship may be reported by both members of a dyad or by either one of them. Since the studies we are doing are for internal evaluation purposes, we chose to apply the greatest rigour to our results. Therefore, data have been symmetrized by the minimum, meaning that both members of the dyad would have had to report the relationship in order

³ The questionnaires contained a roster with the names of CoPEH-LAC participants.

for it to be considered. An exception to this is for the non-respondents: applying this rule to them would have effectively excluded them from the analysis. In these cases, relationships to non-respondents reported by respondents were included in the analysis.

Reporting on all of the data gathered in a short Appendix is impossible. Therefore, since this report comes in support to the claim that CoPEH-LAC has achieved its strategic objectives of developing the community of practice, we will focus on professional contact and collaboration relationships. The following questions were asked to CoPEH-LAC members for these two types of relationships:

- Contact: I had exchanges related to professional issues during workshops, seminars, committee meetings, etc. Excluding meetings linked to CoPEH-LAC.
- Collaboration: I have developed professional activities, such as: collaboration on a research project, an intervention, the organisation of an event or course, a work project, the co-direction of a student or co-authorship of a publication.

Results and interpretation

In what follows, we present the most relevant results linked with the strategic objective in order to keep this appendix to a reasonable length. These results have been presented to and discussed with the members of the community. The last section of the document lists the presentations that have been made on this topic and the upcoming analysis and publications.

At the beginning⁴

As most community of practice, the CoPEH-LAC started with a small group of persons who shared similar values and a common practice.

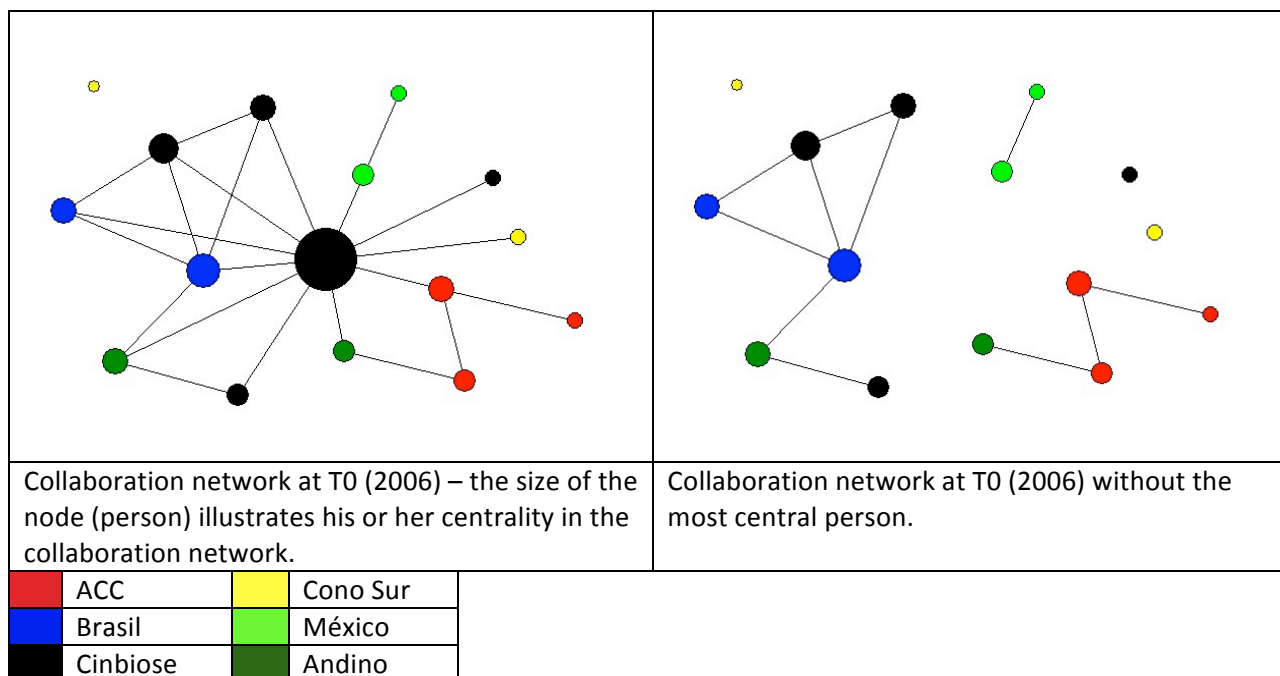


Figure 1 — Collaboration network at T0

⁴ This section is related to Phase 1 and these results have been presented in previous reports. We reiterate them here only to ease the comparison and do not so as to dwell on them.

As can be seen with the above figure, it is mostly one Canadian member (see Cinbiose node final report) who, through her collaborations, served as a broker for the other members of the community. This does not mean that the LAC members were working in isolation. Each was deeply involved in various projects and had developed strong collaborations with colleagues, mostly in their own region. This is illustrated by the following figure showing the answers of the initial members to the question: Who do you think, among your collaborators, would be interested in joining CoPEH-LAC?

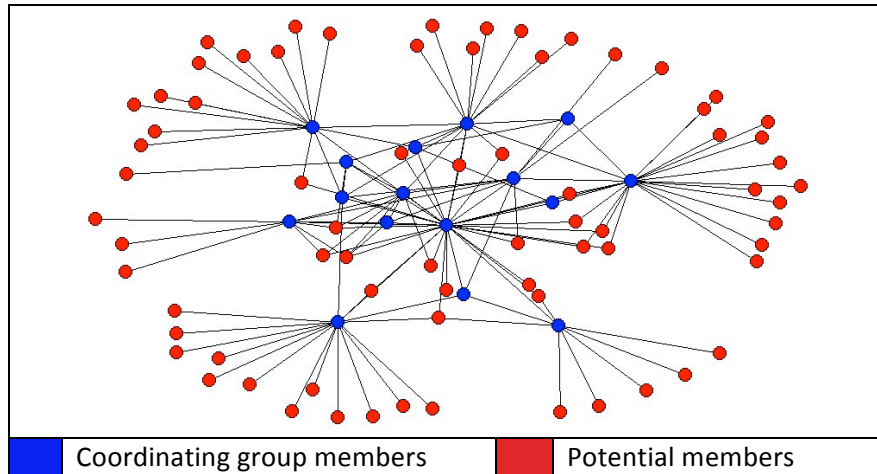


Figure 2 – Potential CoPEH-LAC members at T0

At that time, one of the objectives of the CoPEH-LAC was to promote horizontal communication – especially communication between colleagues throughout Latin America and the Caribbean. As shown in the figure 3, this objective was met over and above expectations within a year and a half.

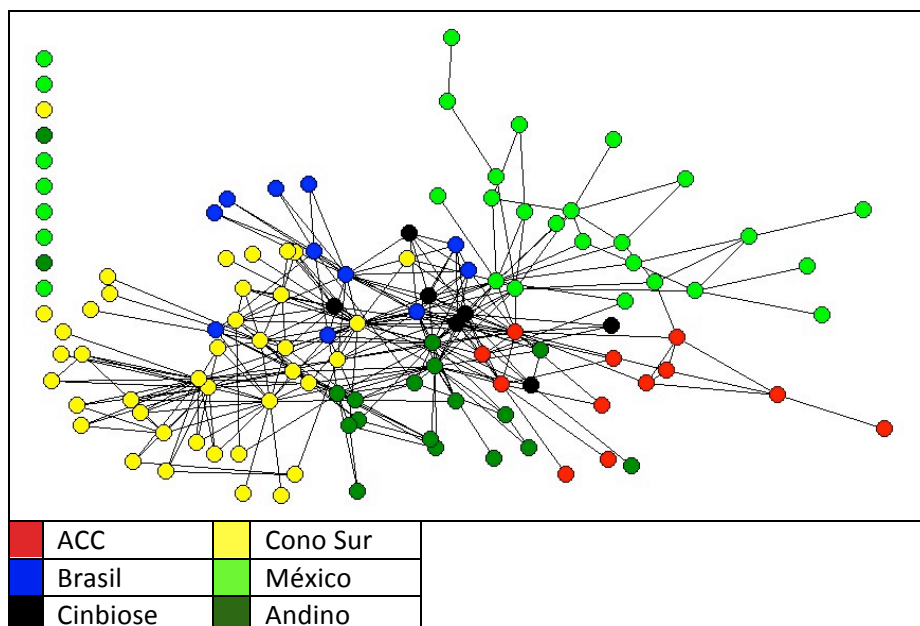


Figure 3 – Collaboration network at T1 (2007)

Resilience

It is one thing to develop new collaborations, it is another to sustain them over the long run, not so much in terms of each specific collaboration, but rather as the web they constitute, holding the community together. While in Phase 1 the growth of the community was an issue, in phase 2, the emphasis was put more on its internal consolidation and resilience.

This objective concretised itself in the fact that the membership stabilized between 2007 (118 members) and 2011 (120 members) although there has been movement in the community as is illustrated in the table 1.

CoPEH-LAC members in 2007 and 2011	Number of people
Members in both 2007 and 2011	55
New members	64
Members in 2007 but not in 2011	63

Table 1 – CoPEH-LAC members between 2007 and 2011

A network can be considered resilient if it remains connected when some of its members leave, but also if the maximum distance⁵ between each member does not become too great.

Because in Phase 2 we also wanted “a robust community of practice that can function well with no over-dependence on any particular member or set of members,” we purposefully removed from the analysis

⁵ The distance is the number of links between two individuals not directly connected.

the most central and intermediary⁶ members in the network to illustrate the augmentation of resilience between 2007 and 2011.

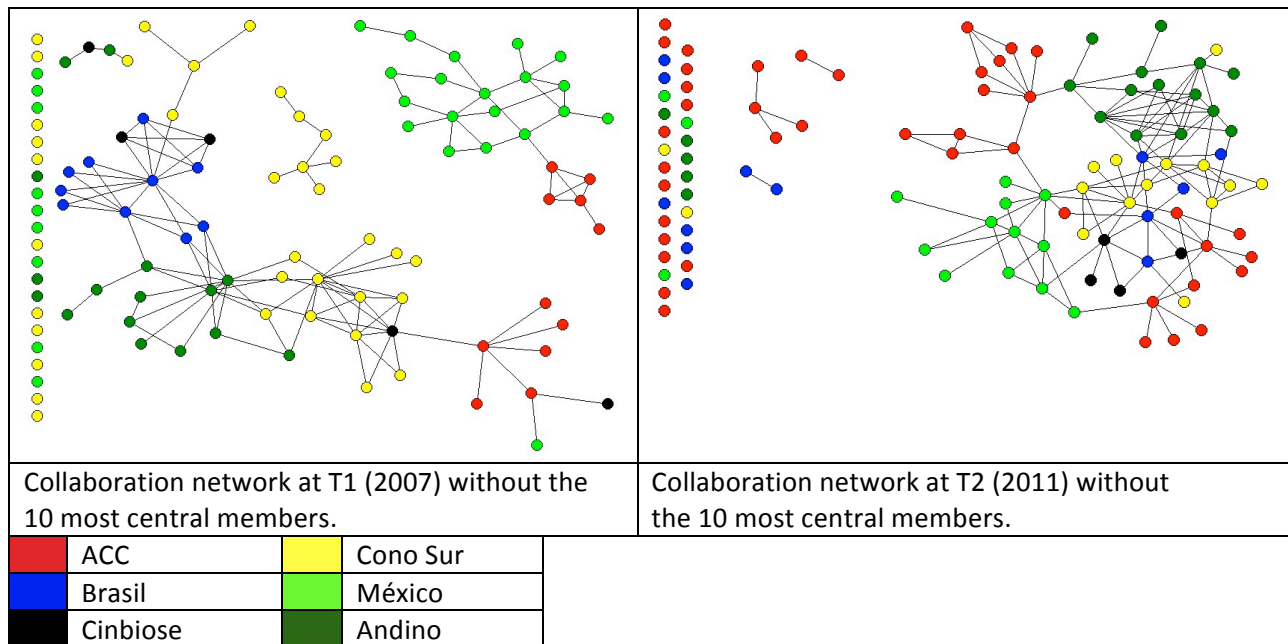


Figure 4 – Collaboration network at T1 and T2 without the 10 most central members

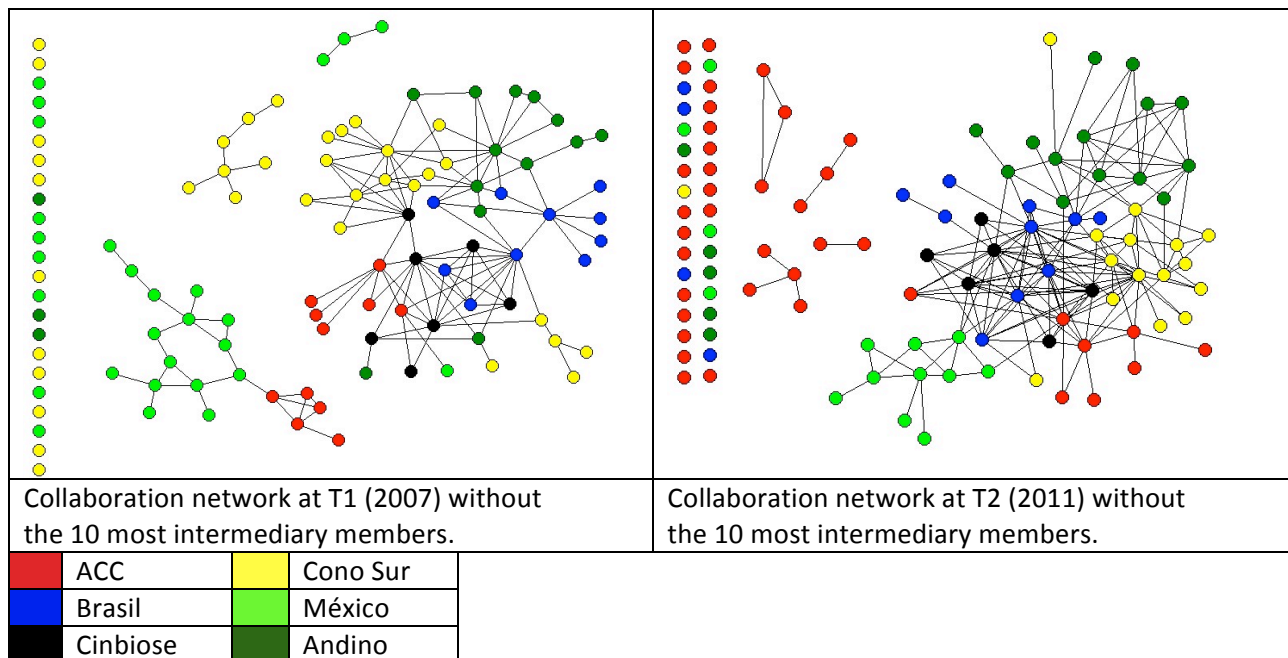


Figure 5 – Collaboration network at T1 and T2 without the 10 most intermediary members

⁶ The degree centrality and betweenness are different ways to measure the centrality of a person in a network. Those most central in terms of degree centrality in a network are more involved in direct relationships than others. Those most intermediate (betweenness) in the network connect individuals or groups of individuals who are not directly connected.

Figures 4 and 5 show that although some members become isolated, the community remains a connected entity despite the “loss” of its most central members. It is worth noting that those who become isolates in this exercise are newcomers. This indicates that many newcomers are attracted or invited to the community by the most central individuals.

These pictures make for a convincing argument for the augmentation of internal consolidation of the CoPEH-LAC. Also, the maximum geodesic⁷ distance between each member in 2007 was 2,1 and it became 1,9 in 2011 – meaning that it became easier to reach someone one does not know in the community “passing by” the relationships connecting the source to the target.

Finally, centralisation in network is a measure that expresses the inequality in the network in terms of centrality: the greater the variance between individuals, the greater the centralization. For example, in a “star” network (Figure 6), centralization would be 100 %. In CoPEH-LAC, centralisation was 63 % in 2007 and lowered to 21 % in 2011.

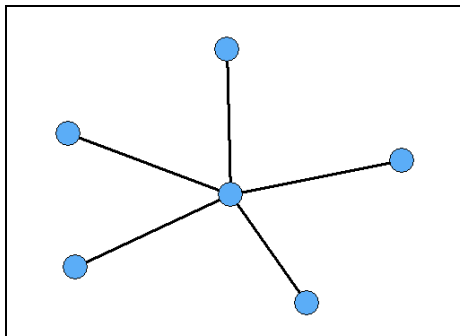


Figure 6 – A centralised network

Diversity and intersectoral collaboration

Being based on an approach where working transdisciplinarily is important, CoPEH-LAC has encouraged the development of intersectoral relationships. Table 2 shows that in 2007, collaborations between nodes were already quite high and it only continued to rise. It appears that this was not a temporary phenomenon caused solely by the novelty of the CoP.

The number of specific disciplines in CoPEH-LAC is impressive and in order to explore interdisciplinary collaboration we grouped people in three large “classic” categories: social sciences and humanities, health sciences and natural sciences. In table 2, it seems that the percentage of interdisciplinary collaboration is high but these results must be tempered by the fact that most of CoPEH-LAC members are in health sciences. In 2011, 75% of the community members were working within the health sciences, 15% within the social sciences and humanities and 13% within the natural sciences (the remaining are unknown).

In 2011, most of CoPEH-LAC members were working in a research institution (70%), some were in a governmental institution (23.3%) and very little were working in an NGO (6.7%).

⁷ The geodesic distance is the shortest number of relations separating two actors not directly connected.

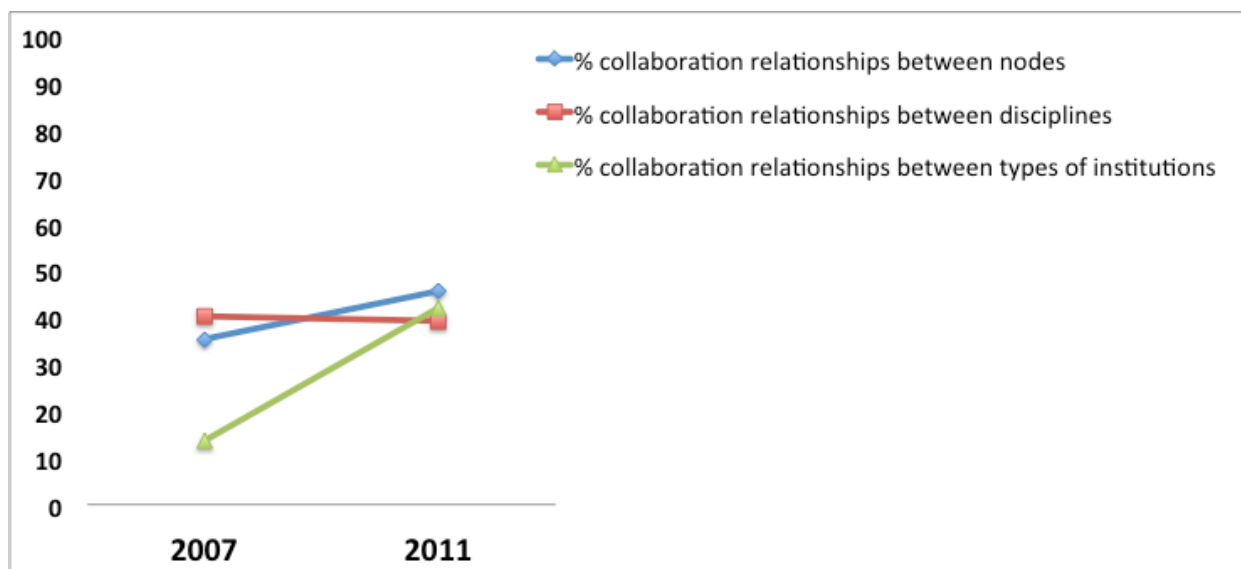


Table 2 – Intersectorial collaboration

Spanish is the most common language in CoPEH-LAC, spoken by 99 members, while Portuguese is spoken by the 15 members of the Brazilian node while the 6 members of the Cinbiose node mostly speak French. As can be seen in table 3, collaboration between languages exists although is not as high as the other intersectorial collaboration.

In terms of gender, the community is composed of 73 women and 47 men and, as shown by table 3, there are as many within as between sex/gender collaborations. One way to understand this result is that, when it comes to collaborate with someone, “gender is not an issue” and, considering the importance of gender equity in CoPEH-LAC, this is good (although not surprising) news.

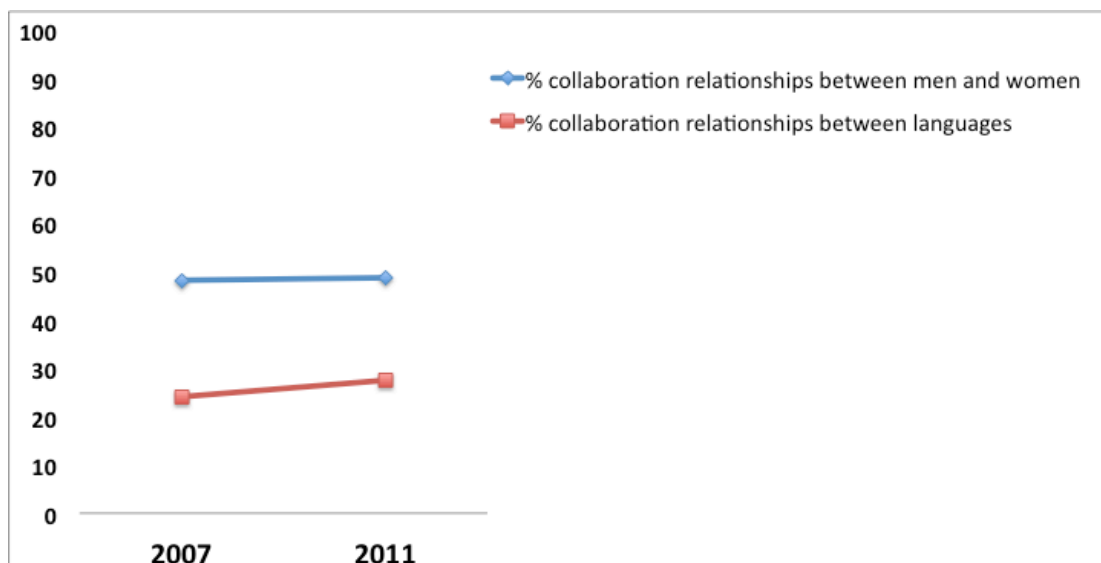


Table 3 – Intersectorial collaboration

Exploration of qualitative data

Open-ended questions were included in the surveys. These questions were of two main types. Some addressed the opinions of the members about the community: their satisfaction (or lack of) with it, the

advantages and limits they perceived and their wishes and needs. Other questions were related their understanding of ecosystem approaches to health and of its various components (see also “Next steps”). Here we present of summary of the findings.

The respondents have expressed great satisfaction towards the CoPEH-LAC. Three main themes emerge from the data: academic exchanges, capacity building and participation.

Under the theme academic exchanges, people have expressed that the community has permitted them to link with various scholars in other disciplines and countries, to better the research they were doing and to diffuse the approach:

...la capacitación y el asesoramiento en las investigaciones
...fortalecer relaciones con investigadores de toda América Latina
A oportunidade de compartilhar experiências e conhecimentos e de poder desenvolver um trabalho de ampla abrangência geográfica e social. Também, desde o ponto de vista acadêmica, poder desenvolver e disseminar a ideia do enfoque ecossistêmico em saúde ambiental.
...se comparte información innovadora que difícilmente se difunde en otros espacios.
Es muy importante para el desarrollo profesional...

With regards to capacity building, respondents referred both to their own learning and to the opportunities to contribute to capacity building on issues related to health, environment and society throughout LAC.

...mejorar el conocimiento
...oportunidad de contribuir con construcción de capacidades en América Latina y el Caribe
El aprendizaje constante, el intercambio de conocimientos e ideas...
Aprendizaje sobre experiencias en otros campos del conocimiento.
Compartir aprendizajes basados en experiencias prácticas.
Un espacio de aprendizaje dinámico.

Finally, the importance of participation is expressed both through the connexions the community renders possible and through the space of dialog and trust it creates.

...la solidaridad y el pensar en equipo, sin querer brillar individualmente, sin fines lucrativos

...fortalecer relaciones con investigadores de toda América Latina.

...y la oportunidad de conocer a profesionales de diferentes ramas y áreas del conocimiento

Vincula la participación en todos los niveles

....las relaciones que están estableciendo entre los investigadores del Sur.

La horizontalidad, criterio amplio y apertura a la reflexión permanente y relaciones fraternas.

...encontrar personas de confianza.

What people see in terms of limits for the CoPEH-LAC is often expressed in terms of lack of resources: time, money and institutional support:

...la falta de financiamiento para investigaciones.

...falta de soporte institucional, que me impide una mayor implicación.

...yo sé que somos mucho ocupados, pero hay unos grupos que hacen pocas cosas cuando seria posible hacer mucho mas...

...lamentablemente no dispongo del tiempo suficiente para cumplir con lo que se me requiere.

Respondents are aware that the results of the survey are anonymous⁸ and destined for the community itself. In that sense, it is a good venue to “pass a message” and to “safely” voice divergences. Hence, this is likely to reduce the social desirability bias and gives us trust in the meaning of those results.

Members of the community appear to be enriched by its existence on many levels. **From their point on view, the CoPEH-LAC reaches its objectives of connexions and learning despite limited resources.**

Challenges

What we have presented above show the relevance of having invested our time in doing such an internal evaluation of our processes since it has permitted us to scientifically support our claim to have reach our objectives related to the building of a community. Nonetheless, we have encountered challenges in doing and have not been able to reach all of what we hoped for with this evaluation process (see also Next Steps).

The most important of these challenges was to be able to link the strength we observed in the structure of the community to its actual accomplishment. For this second phase, CoPEH-LAC has been pressed to do a lot of minute reporting of all of its activities. The annexes of this report and of the previous technical

⁸ We use ID codes for participants which renders individual identification very hard despite the knowledge people have of the community.

report testify of this process. Despite the strategic plan which have permitted to link these activities to objectives and outcomes, the large amount of details required for each activity took its toll on the group that was responsible for it and on nodal coordinating groups. To be able to link the activities / outputs / outcomes to the web of relationships of the community would have required a different organization of the data centered on “collaborative outputs / outcomes”.

We had also hoped to collaboratively analysed the data for and with each nodes and we had hope that the transversal activity “Formación sobre el Análisis de Redes Sociales” would be a space for that. In the end, no node was able to send a representative who would have learn to use social networks and work on the analysis of the data of his or her node.

As with many projects, time is a rare and valued resource. When it comes to realise a survey in a community such as CoPEH-LAC were vast distances are covered, unexpected “time issues” emerge. For example, vacation times do not always coincide, meaning that at almost any given time one region is on summer holidays. Also, internal university and national deadlines are different in each country and region making people’s schedules vastly different. Since we cannot have too large a time frame when collecting relational data, this has proven to be a real challenge which lead us to delay the data collection ending up with the last one not yet gone (see “Next Steps”).

Finally, although we have produced reports and communications both for IDRC and for the CoPEH-LAC, we have not yet completed the scientific publications on which we have worked (see “Next Steps”).

Next Steps

Despite this being a “final” report, the CoPEH-LAC has every intention to pursue its activity and to actively seek ways to support them. It is therefore our intention to keep going with the social network analysis.

Further analyses of the data are currently underway. With respect to the longitudinal aspect, we are exploring the links between collaborative relationships, discussion relationships and trust. One of our hypotheses, based on qualitative results in phase 1, is that trust relationships play an important role in the development of relationships - especially collaborations - in a community of practice such as CoPEH-LAC.

Data on relationship networks were also treated by node. To enrich our analysis and discussion, we have sent each node of CoPEH-LAC their own data and are looking forward to obtain their feedback and qualitative information about the evolution of relational structures in their own node.

This spring, we will conduct another data collection (T3) to enrich our analysis of the longitudinal evolution of the development of CoPEH-LAC. This would particularly of interest to see the what the community looks like after Phase 2 is over.

We are also exploring the connections between social and sociosemantic networks. A sociosemantic network may be conceived of as a specific type of social network for which the relationships between individuals are based on their discourse similarities (Carley, 1986; Cowan & Jonard, 2004; Monge & Contractor, 2003). As we have mentioned in the section on qualitative data, the survey contained questions about how people understood ecosystem approach to health and its related concepts.

That the sociosemantic network should be related to social networks is an accepted postulate although there is still a paucity of studies supporting it (Roth, 2006). We are also looking at the development and

transformation of the sociosemantic network of key concepts in CoPEH-LAC and the development of a common language around these key concepts. We are conducting similar studies in other groups and we plan on comparing the results between various groups. To support this project, we have submitted a grant application the Social Sciences and Humanities Research Council of Canada – should it be successful, this would help greatly to move forward the analyses.

Finally, as discussed in the challenges section, we would like to explore the links between the structure of the community and its outputs and outcomes.

Upcoming publications

Three publications are currently underway:

- 1) *Comunidades de práctica y enfoque ecosalud: ideas que se refuerzan* (book chapter In *El enfoque ecosistémico en salud y ambiente: estado actual y perspectivas*, CoPEH-LAC).
- 2) Success factors for a community of practice - In this paper we propose a model of the main factors - and their interplay - affecting the growth and resilience of a community of practice in ecosystem approach to health. This model emerged from the analysis of CoPEH-LAC and from an extensive literature review.
- 3) Communities of Practice as Social Networks - This article seeks to show the relevance of the social network theory for a better understanding of the processes involved in communities of practice. It also shows how the network of CoPEH-LAC has evolved over time and become resilient to changes in membership.

Communications

So far, aside from presenting the results to the members, we have or will be presenting these analyses in various scientific conferences:

Saint-Charles, J., Rioux-Pelletier, M.E., Mongeau, P., Mertens, F. and St-Cyr Bouchard, M. (2013). “Les communautés de pratique en tant que réseaux sociaux”, Communication, *81^e Congrès de l’ACFAS*, May, Québec, Québec.

Saint-Charles, J., Rioux-Pelletier, M.E., Mongeau, P., Mertens, F. and St-Cyr Bouchard, M. (2013). “Les communautés de pratique en tant que réseaux sociaux”, Communication, *81^e Congrès de l’ACFAS*, May, Québec, Québec.

Mongeau, P. and Saint-Charles, J. (2013). “L’analyse des réseaux dans la recherche sociale appliquée : pertinence et diversité des approches”, Communication, *XXXIIIth Sunbelt Social Networks Conference of the International Network for Social Network Analysis (INSNA)*, May, Hamburg, Germany.

Saint-Charles, J., Mongeau, P., Rioux-Pelletier, M.E., St-Cyr Bouchard, M. and Robert, F. (2013). “Social and sociosemantic relationships: how connected are they?”, Communication, *XXXIIIth Sunbelt Social Networks Conference of the International Network for Social Network Analysis (INSNA)*, May, Hamburg, Germany.

Saint-Charles, J. and Rioux-Pelletier, M.E. (2012). “Estudio de la red de la CoPEH-LAC”, *Asamblea anual de la CoPEH-LAC*, (in collaboration with Mongeau, P., Mertens, F. and Távora, R.) May, Arequipa, Peru.

Saint-Charles, J. (2009). “What are the keys to successful CoPEHs?” Presentation by invitation, IDRC EcoHealth Team, February, Ottawa.

Saint-Charles, J., Rioux-Pelletier, M.E., Mertens, F. and Mergler, D. (2008). South-south communication in a Community of Practice in Ecohealth, Communication, pre-conference *Communication and Social Change: Theory, ICTS, Media, and Francophone Sphere*, 58th International Communication Association Conference, Montréal.

Conclusion

In this Appendix, we have sought to present highlights of the social network internal evaluation process with regard to the objective of “internal consolidation of the community”. Despite work still in progress, we have shown the relevance of using social network analysis to rigorously monitor this objective.

We can conclude from this analysis that CoPEH-LAC has become a robust community of practice that can function well with no over-dependence on any particular member or set of members. It has successfully created a space where new collaborations between regions, disciplines and sectors have flourished. Through these, members have deepened their knowledge on how to deal with *wicked* problems (Rittel & Webber, 1973; Waltner-Toews, 2011; Wesseling & Hoppe, 2010) emerging at the intersection of health, environment and society with ecosystem approaches to health.

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- Carrington, P. J., Scott, J., & Wasserman, S. (2005). *Models and Methods in Social Network Analysis*. Cambridge: Cambridge University Press.
- Cowan, R., & Jonard, N. (2004). Network structure and the diffusion of knowledge. *Journal of Economic Dynamics & Control*, 28, 1557 – 1575.
- Monge, P. R., & Contractor, N. S. (2003). *Theories of Communication Networks*. New York: Oxford University Press.
- Rittel, H. and M. Webber. 1973. Dilemmas in a general theory of planning. *Policy Sciences* 4:155-169.
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- van Wendel de Joode, B., Saint-Charles, J., Aroyo, R., Betancourt, O., Hernández, D. Medel, J., Mertens, F., Barraza, D. and Mergler, D. (2009). *Community of practice in ecosystem health to reduce toxic exposures in Latin America and the Caribbean (CoPEH-TLAC)*, CRDI.
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- Wesseling, A. & R. Hoppe. 2010. If Post-Normal Science is the Solution, What is the Problem?: The Politics of Activist Environmental Science. *Science, Technology & Human Values* 36:389–412.

FINAL TECHNICAL REPORT FOR THE CINBIOSE NODE OF THE COMMUNITY OF PRACTICE IN ECOSYSTEM APPROACHES TO HUMAN HEALTH: LATIN AMERICA AND THE CARIBBEAN APPENDIX 2: PROJECT OUTPUTS

IDRC Project Number-Component Number: 105151-002

Subtitle: Community of practice in ecohealth – dissemination and institutionalization for research, outreach and policy influence in Latin America and the Caribbean

By: Donna Mergler, Johanne Saint-Charles and Jena Webb

Period covered by the report: *June 2009– February 2013*

Date of submission: February 15, 2013

Country/Region: Canada and Latin America and the Caribbean

Full Name of Research Institution: *Centre interdisciplinaire de recherche sur la biologie, la santé, la société et l'environnement (CINBIOSE), Université du Québec à Montréal*

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This annex is concerned with the outputs related to the support and broker roles of the node Cinbiose within CoPEH-LAC. Other outputs can be found in the CoPEH-LAC final report.

Table of contents

Support and broker roles	Erreur ! Signet non défini.
Research Products.....	2
Social network analysis of CoPEH-LAC	2
Manganese Exposure in Latin America	2
Social and sociosemantic network evaluation of Iniciativa sobre Liderazgo y Desarrollo del Campo de Ecosalud y Enfermedades Transmitidas por Vectores (ETV's) en América Latina y el Caribe	3
An Ecohealth Approach to Pesticides in Costa Rica	3
Ecosystems and health in the Amazon.....	4
Climate change and health	5
Sex and gender.....	6
Concepts in Ecohealth.....	6
Collaboration on grant applications and to the forthcoming book.....	6

Research Products

These lists are not exhaustive but representative of the outputs produced in collaboration with or in support of our COPEH-LAC colleagues. Included as well are products that benefitted from our work in COPEH-LAC, including presentations and students' theses.

Social network analysis of CoPEH-LAC

Appendix I. This information is being organized for an article, by Johanne Saint-Charles and Marie Eve Rioux-Pelletier, that will be submitted for publication.

Manganese Exposure in Latin America

We have contributed to a number of projects on ecosystem approaches to manganese exposure in children, bringing our expertise to the table and bringing together LAC researchers in the area. We have co-authored publications with our Brazilian colleagues and contributed substantially to those written by our Mexican colleagues.

Scientific articles

Roels HA, Bowler RM, Kim Y, Claus Henn B, Mergler D, Hoet P, Gocheva VV, Bellinger DC, Wright RO, Harris MG, Chang Y, Bouchard MF, Riojas-Rodriguez H, Menezes-Filho JA, Téllez-Rojo MM. 2012. [Manganese exposure and cognitive deficits: a growing concern for manganese neurotoxicity.](#) *Neurotoxicology* 33:872-80. *This peer-reviewed publication was derived from a communication, co-authored by Donna Mergler, Maryse Bouchard, Horacio Riojas-Rodriguez, Jose Antonio Menezes-Filho and Astrid Schilmann, and presented at the International Symposium on Neurobehavioral Methods and Effects in Occupational and Environmental Health held in Xi'an in 2011. We carried out a meta analysis of the data from studies in Mexico, Brazil and Quebec.*

Menezes-Filho JA, Novaes Cde O, Moreira JC, Sarcinelli PN, Mergler D. 2011. Elevated manganese and cognitive performance in school-aged children and their mothers. *Environ Res.* 111:156-63.

Riojas-Rodríguez H, Solís-Vivanco R, Schilmann A, Montes S, Rodríguez S, Ríos C, et al. 2010. Intellectual Function in Mexican Children Living in a Mining Area and Environmentally Exposed to Manganese. *Environ Health Perspect* 118:1465-1470. *Donna Mergler contributed considerably to this publication, but preferred not to be co-author*

Menezes-Filho JA, Paes CR, Pontes AM, Moreira JC, Sarcinelli PN, Mergler D. 2009. [High levels of hair manganese in children living in the vicinity of a ferro-manganese alloy production plant.](#) *Neurotoxicology* 30:1207-13.

Torres-Agustín R, Rodríguez-Agudelo Y, Schilmann A, Solís-Vivanco R, Montes S, Riojas-Rodríguez H, Cortez-Lugo M, Ríos C. [Effect of environmental manganese exposure on verbal learning and memory in Mexican children.](#) *Environ Res.* 2012 Nov 6. [Epub ahead of print] *Donna Mergler contributed to this publication*

Hernández-Bonilla D, Schilmann A, Montes S, Rodríguez-Agudelo Y, Rodríguez-Dozal S, Solís-Vivanco R, Ríos C, Riojas-Rodríguez H. (2011) [Environmental exposure to manganese and motor function of children in Mexico.](#) *Neurotoxicology* 32:615-21. *Donna Mergler contributed to this publication*

Presentations

Mergler D. (2013). *Manganeso y efectos neurotóxicos en niños y niñas.* Instituto Regional de Estudios en Sustancias Tóxicas Seminar Series, Universidad Nacional, Costa Rica

Social and sociosemantic network evaluation of Iniciativa sobre Liderazgo y Desarrollo del Campo de Ecosalud y Enfermedades Transmitidas por Vectores (ETV's) en América Latina y el Caribe

Reports: The reports have been transmitted to the executive committee to be added to the technical report of the initiative.

Mertens, F., Saint-Charles, J., Rioux-Pelletier, M.E. (2012). *Informe sobre el analysis de redes sociales del Proyecto liderazgo en ecosalud para las enfermedades transmitidas por vectores. – Tiempo 0.*

Saint-Charles, J., Rioux-Pelletier, M.E., Mertens, F. et Tavora, R. (2013). *Informe sobre el estudio de redes sociosemánticas Tiempo 0 del Proyecto liderazgo en ecosalud para las enfermedades transmitidas por vectores.*

Tavora, R., Mertens, F., Saint-Charles, J., Rioux-Pelletier, M.E. et Triana Rodríguez, D. (2013). *Informe sobre el analysis de redes sociales del Proyecto liderazgo en ecosalud para las enfermedades transmitidas por vectores. – Tiempo 1.*

An Ecohealth Approach to Pesticides in Costa Rica

Scientific articles

Barraza, D.; Jansen, K; van Wendel de Joode, B., Wesseling, C. (2013). Social movements and risk perception: unions, churches, pesticides and bananas in Costa Rica, International Journal of Occupational and Environmental Health. *Johanne Saint-Charles and Marie-Ève Rioux-Pelletier contributed to this aspect of the project.*

van Wendel de Joode B, Barraza D, Ruepert C, Mora AM, Córdoba L, Oberg M, Wesseling C, Mergler D, Lindh CH. 2012. Indigenous children living nearby plantations with chlorpyrifos-treated bags have elevated 3,5,6-trichloro-2-pyridinol (TCPy) urinary concentrations. *Environ Res.* 117:17-26.

Presentations

Rioux-Pelletier, M.E., Saint-Charles, J., Barraza, D. et B. van Wendel de Joode (2011). « Défis et expériences du partage des résultats d'une étude sur les dynamiques de la diffusion d'informations sur les pesticides et leurs effets sur la santé dans une communauté du Costa Rica », Communication dans le cadre du colloque La participation en recherche : sommes-nous toutes et tous concernés ?, Centre de recherche interdisciplinaire sur la biologie, la santé, la société et l'environnement (CINBIOSE), Université du Québec à Montréal (UQAM) Canada.

Rioux-Pelletier, M. E., Saint-Charles, J., Barraza, D., & van Wendel de Joode, B. (2009). *Las dinámicas de la difusión de información sobre los plaguicidas y sus efectos sobre la salud en una comunidad de Costa Rica .*

http://www.isa.una.ac.cr/index.php?option=com_remository&Itemid=13&func=fileinfo&id=16

Poster presentation

Rioux-Pelletier, M.E., Saint-Charles, J., Barraza, D. et van Wendel de Joode, B. (2010). « What is at stake in the diffusion of information on the health effects of pesticides in a Costa Rican community? », Prize for best poster at the *Colloque sur les bonnes pratiques de recherche en santé mondiale* ; Co-organisation and participation in the *Colloque sur les bonnes pratiques de recherche en santé mondiale*, Axe de recherche en santé mondiale du Réseau de recherche en santé des populations du Québec (RRSPQ).

Thesis

Rioux-Pelletier, M.E. (2009). « Les dynamiques de la diffusion d'informations sur les pesticides et leurs effets sur la santé dans une communauté du Costa Rica ». Mémoire. Montréal (Québec, Canada), Université du Québec à Montréal, Faculté de communication, Maîtrise en communication.

Ecosystems and health in the Amazon

Scientific articles

Valadão, L., Mertens, F., Saint-Charles, J. Davidson, R., Lucotte, M. Sousa Passos, C. J., Romana, C. (soumis). Identificação e caracterização de lideranças comunitárias nos temas de agricultura e saúde: uma análise de redes sociais em comunidades da Amazônia brasileira. *Acta Amazonica*

Mertens, F., Saint-Charles, J. et Mergler, D. (2011). Social communication network analysis of the role of participatory research in the adoption of new fish consumption behaviors *Social Science and Medicine*. [dx.doi.org/10.1016/j.socscimed.2011.10.016](https://doi.org/10.1016/j.socscimed.2011.10.016) (see Appendix xx).

Fillion M, Philibert A, Mertens F, Lemire M, Passos CJ, Frenette B, Guimarães JR, Mergler D. (2011) Neurotoxic sequelae of mercury exposure: an intervention and follow-up study in the Brazilian Amazon. *Ecohealth*. 8:210-22.

Fillion M, Lemire M, Philibert A, Frenette B, Weiler HA, Deguire JR, Guimarães JR, Larribe F, Barbosa F Jr, Mergler D. (2011). Visual acuity in fish consumers of the Brazilian Amazon: risks and benefits from local diet. *Public Health Nutr*. 14:2236-44.

Lemire M, Philibert A, Fillion M, Passos CJ, Guimarães JR, Barbosa F Jr, Mergler D. (2012) No evidence of selenosis from a selenium-rich diet in the Brazilian Amazon. *Environ Int*. 40:128-36.

Lemire M, Fillion M, Frenette B, Passos CJ, Guimarães JR, Barbosa F Jr, Mergler D. (2011) Selenium from dietary sources and motor functions in the Brazilian Amazon. *Neurotoxicology*. Dec;32(6):944-53.

Lemire M, Fillion M, Frenette B, Mayer A, Philibert A, Passos CJ, Guimarães JR, Barbosa FJ, Mergler D. (2010) Selenium and mercury in the Brazilian Amazon: opposing influences on age-related cataracts. *Environ Health Perspect*. 118:1584-9.

Lemire M, Fillion M, Barbosa F Jr, Guimarães JR, Mergler D. (2010) Elevated levels of selenium in the typical diet of Amazonian riverside populations. *Sci Total Environ* 408:4076-84.

Fillion M, Passos CJ, Lemire M, Fournier B, Mertens F, Guimarães JR, Mergler D. (2009) Quality of life and health perceptions among fish-eating communities of the Brazilian Amazon: an ecosystem approach to well-being. *Ecohealth* 6:121-34.

Barbosa F Jr, Fillion M, Lemire M, Passos CJ, Rodrigues JL, Philibert A, Guimarães JR, Mergler D. (2009) Elevated blood lead levels in a riverside population in the Brazilian Amazon. *Environ Res* 109:594-9.

Book chapter

J-R Guimarães and D Mergler A Virtuous Cycle in the Amazon : Reducing Mercury Exposure Requires Sustainable Agriculture. Chap. 10 in *Ecohealth Research in Practice : Innovative Applications of an Ecosystem Approach to Health* (Ed. D. Charron). Springer, 2012

Presentations: (posters and oral)

Béliveau, A., Lucotte, M., Davidson, R., Berçot, M., Mertens, F., Saint-Charles, J., (2011). Adoption of practices aiming at reducing soil Hg mobility: the challenges of promoting sustainable agriculture in the PLUPH project, linking human health, land use and environmental change, in the Brazilian

- Amazon. Affiche présentée lors de la 10^e conférence « *Mercury as a global pollutant* », Halifax (Canada).
- Oestreicher, J. S., Lucotte, M., Davidson, R., Mertens, F., Romana, C., Saint-Charles, J., Passos, C., Amaral, D., Rozon, C., Valentini, J. (2011). « Social processes and underlying drivers related to mercury mobilization and exposure: the case of the Tapajos River region, Brazilian Amazon. », *International Conference on Mercury as a Global Pollutant (ICMGP)*, Halifax, (Canada).
- Lemire, M. (2011) Selenium and mercury: opposing influences in fish-eating populations of the Brazilian Amazon *International Conference on Mercury as a Global Pollutant (ICMGP)*, Halifax, (Canada).
- Fillion, Myriam (2011) Mercury research in the Brazilian Amazon: From research to results sharing to research... *International Conference on Mercury as a Global Pollutant (ICMGP)*, Halifax, (Canada).
- Mergler D. (2011). *Du mercure dans les poissons. Les Explorateurs Scientifiques*. This presentation was part of a series of lectures organized by UQAM for high school students.
- Mergler D. (2011). An ecosystem approach to mercury contamination in the Brazilian Amazon : Maximizing the intake of beneficial foods while minimizing toxic risk, Seminar series at the University of Illinois, Champaign.
- Mergler D. (2010) While waiting for mercury mitigation at the source (primary prevention): assessment of dietary factors that affect mercury absorption and/or toxicity. *Contaminación por metales: impacto sobre el ambiente, la salud y la sociedad*, Oruro (Bolivia),
- Mergler D. (2010) *Le poisson, le mercure et la santé*. Invited speaker at the 23 ième Entretiens Jacques-Cartier, Lyon (France)
- Mergler D. (2009) Mercury challenges to human health : the need for concerted global and local action. Keynote address at the *International Conference on Mercury as a Global Pollutant (ICMGP)*, Guiyang, (China).
- Mergler D (2009) Can we maximize nutritional intake while minimizing toxic risk from fish consumption? Invited lecture at the United States Environmental Protection Agency Fish Forum, Portland, Oregon (USA).
- Mergler D (2009) An ecosystem approach to mercury in the Brazilian Amazon. Meeting on women's environmental health organized by the Spanish Ministry of Health (invited by the Gender and Health Institute of CIHR)

Thesis

Mélanie Lemire :

Myriam Fillion:

Climate change and health

Scientific article

An article is in preparation with F. Mertens and P. Girard: A network approach to the analysis of multistakeholder and multilevel collaborations in adapting to climate change.

Presentations

Saimpaio, N., Zalla, O., Arakaki, A., Covolan, J.; Girard, P., Ioris, A., Aristimuño, A. Donadío, A., Saint-Charles, Johanne; Priante Filho, N. (2012) « Community of practice driven by Cooperant Researchers

to promote climate compatible development - ¡Adapting! », ISEE Conference (International Society for Ecological Economics), 16-19 June 2012, Rio de Janeiro, Brazil.

Sex and gender

Scientific articles

Saint-Charles, J, Rioux-Pelletier, M.-E, Mertens, F., Mongeau, P. (2012). « Diffusion of environmental health information: the role of sex- and gender-differentiated pathways », *What a Difference Sex and Gender Make: A Gender, Sex and Health Research Casebook*, Canadian Institutes of Health Research Institute of Gender and Health. Available at: <http://www.cihr-irsc.gc.ca/e/44734.html> (in English); <http://www.cihr-irsc.gc.ca/f/44734.html> (in French).

Mergler D. Neurotoxic exposures and effects : gender and sex matter! Hänninen Lecture 2011. (2012) *Neurotoxicology*. 33:644-51. The content of this paper was also given as a COPEH_LAC webinar.

Rioux-Pelletier, M.E., Saint-Charles, J., Mertens, F. et P. Mongeau (2012). « Diffusion of Environmental Health Innovations: The Role of Sex and Gender Differentiated Pathways », Communication dans le cadre du XXXII International Sunbelt Social Network Conference, Redondo Beach, California.

Concepts in Ecohealth

Scientific articles

Berbés- Blázquez, M., Oestreicher, S., Mertens, F., Saint-Charles, J. (submitted) Ecohealth and resilience thinking: A dialogue from experiences in research and practice. *Ecology & Society*.

Book chapters in preparation

A book is in preparation (see CoPEH-LAC report). Donna Mergler is writing a prologue with Berna van Wendel and a chapter on epidemiology in Ecohealth with Horacio Riojas and Berna van Wendel

Johanne Saint-Charles and Marie Eve Rioux-Pelletier are writing a chapter with Anita Lujan (nodo Andino): *Comunidades de práctica y enfoque ecosalud: ideas que se refuerzan*

Presentations

Mergler D (2012) *Polluants de l'environnement: défis scientifiques et empowerment des personnes concernées*. Invited lecture at the *Institut Français de l'éducation, Lyon (France)*

Mergler D. (2011) Ecosystem Approaches to Human Health. Invited lecture at a Summer Course in Occupational and Environmental Medicine at the University of Brescia, Italy .

Mergler D (2011) *Ecosistemas y salud : integración de las ciencias sociales y naturales para mejora la salud*. *Universidad Nacional, Costa Rica*

Mergler, D (2011) *Ecosanté: méthodes et défis* Seminar series at the *Institut Armand-Frappier*

Collaboration on grant applications and to the forthcoming book

To insure its longer-term sustainability, CoPEH-LAC has made several grant applications. Cinbiose node members have participated in the writing of the following (details are in CoPEH-LAC final report):

- In 2010, Johanne Saint-Charles and colleagues from South America applied to the IRIAC Program for the project *Adaptation to Climate Change as an Opportunity for Regional Development program (ACCORD)*: letter of intent accepted, full grant application not successful.

- In 2012, Johanne Saint-Charles contributed to the grant application *Desarrollo e innovación de sistemas de producción agrícolas familiares y comunitarios sustentables, saludables, y con equidad, para promover seguridad económica y la soberanía alimentaria de los hombres y las mujeres de poblaciones indígenas, rurales, y urbanas en América Latina y el Caribe*, which was submitted to IDRC
- In 2011, a successful grant application was submitted by Donna Mergler and Berna van Wendel to Health Canada (\$70,000 CAN), which provided funds to include manganese exposure and integrate Brazilian researchers into the IDRC financed Birth Cohort Project in Costa Rica
- In 2010, a successful grant application was submitted to the Planning and Meetings Program of CIHR (\$19,000) to bring COPEH-LAC researchers from Mexico, Costa Rica and Brazil to the Neurotoxicology Meeting in Portland Oregon in June 2010. They presented the results of their studies and met with researchers from different countries. Here we set up an international group to support the Birth Cohort Study in Costa Rica.
- In 2012, we submitted a grant application to CIHR for COPEH-LAC members to attend the meeting on Neurobehavioral Methods and Effects in Occupational and Environmental Health, which will be held in Capetown in March, 2013. Although we were unsuccessful, several COPEH-LAC members obtained local funding and Berna van Wendell de Joode will be a keynote speaker.
- In 2012, Donna Mergler submitted a grant application to a new program offered by the Mexican Embassy in Canada to spend time with members of the Mexican node in order to organize a program on an Ecohealth Approach to the Role of Toxic Exposures in the Growing Epidemic of Non-Communicable Diseases. Note that Donna Mergler was invited to an international workshop held in Costa Rica in November, 2012 to present an Ecohealth Approach to Chronic Kidney Disease in Meso-America.
- In 2013, Donna Mergler and Berna van Wendel with CoPEH-LAC colleagues from Mexico and Brazil submitted a grant application to CIHR entitled “Does manganese from mancozeb affect children’s neurodevelopment: follow-up of a birth cohort study”. This grant application seeks to follow-up the IDRC financed birth cohort study in Costa Rica.
- A joint grant application was submitted in February 2013 to IDRC by CoPEH-Canada and CoPEH-LAC: Pan-American Partnership for the strengthening of research, policy and practice at the intersection of health, ecosystems and society.