

Building capacity to develop national CARcinogen EXposure (CAREX) projects in Latin America and the Caribbean

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EXECUTIVE SUMMARY

This report describes the culmination of a project that sought to enhance knowledge about exposure to cancer-causing substances in Latin American and Caribbean (LAC) workplaces. The project, funded by the Canadian Partnerships division of the IDRC, involved a close collaboration between Canadian and Latin American-based organizations to discuss a general research methodology (CAREX) and ways that the CAREX approach may be adapted for each country in LAC. This was the first time that researchers from North and South America convened on the topic of occupational carcinogen exposure surveillance, an issue that is pervasive and has shared challenges across participating countries, including Canada.

The key advance of this grant was the development of a network of researchers, data, and tools to facilitate the adoption of CAREX in LAC. The two-day workshop held in Bogota during the first year of this project brought together researchers and representatives from approximately a dozen countries in LAC. For some, this meeting was their first foray in the CAREX approach. Research issues unique to LAC, such as the preponderance of informal workers, were brought to the fore and discussed at length. Information packages produced by CAREX Canada for this meeting (e.g. on lung cancer and exposures in the mining and construction sectors) were translated to Spanish to demonstrate the different ways that CAREX data can be combined, applied, and communicated to target audiences.

After the workshop a smaller group of partners on this project began working on a technical guide. The purpose of this document was to provide a brief background of the CAREX principles and a thorough step-by-step explanation of the CAREX exposure assessment methods, replete with examples of how CAREX has been adapted and implemented in LAC and Canada. The guide, which was translated to Spanish, reflected the particular research problems that were raised by participants at the Bogota workshop. Tailoring the guide to the LAC context was intended to enhance its use in this region; already, CAREX researchers in Chile have received the guide and there are plans to apply it in a forthcoming CAREX Caribbean project.

This grant played an important role in prompting the initiation of new CAREX projects in LAC; specifically, Peru and Chile. The approach taken in Peru was particularly engaging as it involved multiple roundtable discussions with scientists and stakeholders, including policy-makers, on deciding priority occupational carcinogens and exposed working populations. The preliminary results of these projects are currently being refined and CAREX Canada is providing ongoing technical assistance on methodological questions. Researchers from Costa Rica, where CAREX was first implemented outside of Europe, intend on updating their exposure estimates in the near future.

Other important outcomes of this grant were not planned at the outset but are significant achievements upon which future work will be based. Namely, the success of this project played a role in the Occupational Cancer Research Centre (OCRC) being designated as a World Health Organization (WHO) Collaborating Centre in Occupational and Environmental Cancer. This designation recognizes and honours our multiple years of partnership with PAHO on projects addressing occupational cancer research, surveillance and prevention, including the present IDRC-funded project. The technical guide, informed by scientific evidence and input from LAC participants, is an important innovation because it is the first-ever CAREX manual in Spanish that is detailed and tailored to the region's labour force trends and data availability. Another outcome was the securing of additional funding from PAHO for a CAREX Caribbean project, which will commence in late 2016 and build nicely upon the IDRC-funded work.

THE RESEARCH PROBLEM

Cancer is a leading cause of death and disease burden in Latin America and the Caribbean (LAC). Occupational exposure to carcinogens is an important cause of cancer; as much as 8% of lung cancer cases alone are attributed to workplace exposures to well-established and prevalent carcinogens such as asbestos, crystalline silica, and diesel exhaust.

Exposure to these and many other occupational carcinogens is known to occur in LAC, but there are few surveillance systems in place to monitor among who and where exposure occurs. It is important for both researchers and non-researchers to have high-quality, population-based information about occupational carcinogen exposures. From a scientific perspective, exposure data are essential for identifying the most exposed workers, monitoring trends in exposure over time, and evaluating the impact of interventions designed to reduce exposure to occupational hazards. Additionally, exposure information is a crucial component of cancer epidemiology and burden studies. Non-researchers, including (but not limited to) government agencies, employers, and organized labour groups, can use exposure data to allocate limited resources to the most at-risk workers, as well as inform the development of prevention programs and policies.

The CAREX method, initially developed by researchers in Finland, was previously adapted in LAC in Costa Rica, Nicaragua, and Panama, as well as in Colombia. This approach to population-wide exposure assessment has proven useful for quantifying the number of workers exposed to priority occupational carcinogens within each country, with the ability to further locate exposed workers by industry and sex, and sometimes by level of exposure. The main objective of this project was to enhance estimates of occupational carcinogen exposure in LAC using the CAREX system. A secondary aim was to gain input on CAREX priorities and translate knowledge for occupational cancer awareness and prevention.

The research process did not lead to a revised view of the research problem, which we knew well from our previous years of work with PAHO prior to applying for and receiving this grant. However, by engaging with researchers from across LAC, we deepened our understanding of particular research issues. For instance, we were aware that informal workers were present in LAC, but during the research process we discovered from our LAC peers that the magnitude of labour informality substantially differs between countries and by gender. In some countries the informal workforce is so large (>50% of all workers) and statistics so sparse that it is extremely difficult to quantify informal workers, let alone determine their industries and occupations and the proportion exposed to individual occupational carcinogens. It became apparent that a modeling approach may be needed to address this challenge. Other working conditions were also discussed – like labour migration, child labour, bonded labour, and temporary and sub-contractual labour – although it was not entirely clear how to assess occupational carcinogen exposures for workers in each of these unique, but increasingly common, working situations.

Nevertheless, the primary objective of this project was successfully attained and it has made an important scientific contribution to occupational exposure assessment in LAC. The value of this foundational work cannot be underestimated; for instance, the knowledge produced from CAREX projects in LAC will eventually contribute to enhanced estimates of the global burden of occupational cancer. The project outcomes and results from current CAREX projects in LAC can also be used by PAHO to mobilize governments in LAC on occupational hazard control and cancer prevention. The secondary objectives of the project were met, albeit to a lesser extent since our focus was on building CAREX projects that could then be used to raise awareness and make policy changes. Stakeholders at the

Bogota workshop provided useful input on the potential uses of CAREX data, but gave minimal comment on priority exposures.

PROGRESS TOWARDS MILESTONES

The project milestones, as listed in the MOU (Attachment B: Schedule of Project Milestones), were:

1. Commencement
2. Initial payment
3. First technical progress report, covering the first 12 months of research work
4. First financial report, covering the first 12 months of research work as per the requirements of Section A13.2
5. Payment by the Centre, following acceptance of first technical progress report and satisfactory financial report
6. Final technical report (two print copies and, where possible, an electronic copy)
7. Final financial report covering all funds expended on the project, in the same form and including the details of the Budget as set forth in Attachment C – see Section A13.6
8. Final payment by the Centre, following acceptance of the final technical report (including, among other things, the research results dissemination plan) and satisfactory final financial report

The milestones of this project were successfully achieved. The project commenced on December 1, 2013 and the initial payment was received on time. Our interim technical and financial reports were submitted on February 27, 2015. Funding for the following year of research work was received from the IDRC. A six-month extension ending September 30, 2016 was requested and granted in order to accommodate the time needed to finalize, translate, and publish the technical guide. The budget was also amended to account for greater research staff time and the decision not to publish a peer-reviewed scientific article (thus focusing on the open-access and detailed technical guide).

Our plan to disseminate research results is ongoing. Presentations about this project have been given by PAHO at two large international scientific conferences: the International Agency for Research on Cancer's 50th Anniversary Conference held in Lyon, France in June 2016; and the 25th EPICOH Conference held in Barcelona, Spain in September 2016. The success of this project and the need for continued work has been emphasized within PAHO, including at a Collaborating Centre meeting hosted by PAHO in Montreal in September 2015, which was attended by the OCRC. These discussions have prompted PAHO's Caribbean office to provide a small amount of funding to begin a CAREX Caribbean project. The major research output of this project (the technical guide, annexed to the Bogota workshop proceedings) will be used as a practical tool and reference in the Caribbean and elsewhere in LAC. The Spanish version of the guide will be disseminated to PAHO's partners in workers' health and will be used as a policy advocacy piece to Ministries of Health in LAC.

SYNTHESIS OF RESEARCH RESULTS AND DEVELOPMENT OUTCOMES

As stated in the MOU, the overall objective of this project was to promote awareness of occupational cancer and encourage the use of CAREX data in occupational cancer prevention strategies in LAC. The specific objectives of this project were:

- Using a novel, collaborative approach, to enhance estimates of occupational carcinogen exposure in LAC by building national evidence-based CAREX surveillance programs in LAC
- Researchers from Canada and LAC to exchange knowledge and discuss practical methods for estimating exposure
- To involve other stakeholders (government, informal worker groups, and the private sector) to gain input on CAREX priorities and translating knowledge

The main research results during the project were the proceedings of the two-day knowledge exchange workshop held in Bogota, Colombia, and a bilingual (English/Spanish) technical guide. These results demonstrate the progress made towards all three objectives listed above.

This project was a truly collaborative endeavour. Partners from PAHO, the National Cancer Institute of Colombia, and the Universidad El Bosque played an important role in planning the logistics of the workshop, co-developing the workshop agenda, and identifying participants from approximately a dozen countries in LAC. CAREX Canada and the OCRC provided presentations about CAREX and its applications in epidemiological, surveillance, and burden studies. At the meeting, representatives from each participating country were given ample opportunity to discuss the current status of occupational cancer research in their country, especially their progress on a CAREX project and any barriers or facilitators to their CAREX project. Stakeholders from the organized labour community in Colombia, as well as government representatives from a few countries, were present and provided some thoughts on knowledge gaps and the potential use of CAREX data. These conversations were meticulously recorded in the workshop proceedings and used to inform the subsequent technical guide.

The technical guide was primarily a joint effort between the OCRC, CAREX Canada, and PAHO. The purpose of the guide was to delineate the CAREX approach in a few steps, with examples of its development and implementation from Canada and LAC countries with a CAREX project. A section in the guide addressed knowledge translation, and each step of the methods included ways to engage stakeholders. The guide was professionally designed for greater uptake by target audiences in English and Spanish.

From the perspective of Canadian partners on this project, we expected and looked forward to enhancing our understanding of occupational cancer and exposure surveillance in LAC. It was especially interesting to learn about how the labour force is changing in LAC. For example, we learned at the workshop that a large amount of labour in Panama revolves around the expansion of the Panama Canal, rendering construction-related exposures as an area of concern. In some countries there are conscious efforts being made to formalize work by incorporating informal workers in social security programs. We also realized that a challenge in the Caribbean is the small number of industries and small businesses nested within them. There is a tremendous amount of diversity in labour demographics, economic development, and carcinogenic exposures at work in LAC. This project confirmed that the CAREX methodology is the most robust, practical way to address gaps in knowledge about exposure in LAC.

The research results are gradually being used by researchers and stakeholders to generate new knowledge about cancer-causing exposures in LAC workers at the population level. The workshop itself helped to catalyze the development of CAREX projects in Peru and Chile. In Peru, the approach has involved roundtable consultations with government representatives and experts who have helped to identify priority occupational carcinogens, labour force information, and proportion exposed values. The

project in Chile is currently in progress. A member of the research team has reached out to CAREX Canada with a methodological question about exposures in multiple occupations. Within the next year, the technical guide will be used to assist countries with developing their own CAREX projects. A workshop for the Caribbean is currently in the planning stages. The guide will be made freely and electronically available to all countries in English and Spanish. Within 3 years of the end of this project, we anticipate that a growing number of countries will uptake the knowledge, resources, and networks from this project to begin their own national CAREX efforts.

Although there were no explicit research ethics issues in this project, as Canadian partners we were mindful of taking a collaborative approach and jointly producing outputs that met research needs primarily in LAC. We were appreciative of the advances in LAC that we have yet to address in Canada, such as developing estimates of occupational exposure to individual pesticides (this has been done in Costa Rica, Nicaragua, and Panama) and accounting for workers who are not captured by national statistics (this has also been completed in Costa Rica and Chile is working towards this goal). The methods used for pesticides are interesting and relevant for prospective CAREX Canada research on individual pesticides that were recently classified as known or potential carcinogens. Although Canada does not have as large a proportion of informal workers as in most LAC countries, there are seasonal and migrant workers who may be accounted for in future exposure estimations.

Social, gender, and environmental dimensions arose during the research process. As previously mentioned, informal workers were a concern to participants at the Bogota workshop because they are a large population of significant social and economic importance but with sparse data on exposure to occupational hazards and underrepresentation in national labour force statistics. Incorporating informal workers in CAREX projects, which was expressed as desirable by several countries, has implications on the way that the CAREX methodology may be adapted and the types of data used. Some informal work is gendered; even in the formal labour force, there are differences in the distribution of men and women in certain industries and occupations. All countries should be able to account for sex in their CAREX projects. Although occupational exposure levels are typically higher than those encountered through environmental exposure, many of the carcinogens that are found in workplace settings in LAC (and Canada) are also ubiquitous in the general environment (e.g. diesel engine exhaust, solar ultraviolet radiation, radon, and others). Knowledge of exposures in workplace settings can advance awareness and prevention of environmental exposure, as well.

METHODOLOGY

The methods used to achieve this project's objectives and outcomes were fairly straightforward and involved two general components: 1. a knowledge exchange and capacity-building workshop; and 2. ongoing technical assistance to support the adaptation and application of the general CAREX methodology.

The workshop engaged representatives from 13 different countries in the Americas on the themes of occupational carcinogen exposure surveillance, the CAREX model and its applications, and specific issues affecting surveillance research. Participants had the opportunity to speak about the current status of CAREX projects in their country and to describe the challenges. Examples of how CAREX have been developed in different countries were discussed, and this was supplemented with knowledge packages from CAREX Canada and a discussion of how CAREX results can be applied in occupational cancer research.

Technical assistance primarily occurred through the production of a technical guide and the provision of expertise and resources to LAC-based researchers seeking support. The technical guide consisted of a complete description of the CAREX method tailored to the LAC context, worksheets, and a comprehensive list of references to published articles and resources detailing the CAREX origins, methodology, and its uses in multiple countries worldwide. This guide will be used in a forthcoming CAREX Caribbean workshop, for other prospective CAREX projects in LAC, and as a reference for advocating for occupational cancer prevention. Technical assistance has also been provided in personal communications with researchers from LAC countries (Peru and Chile) who began CAREX projects for their own countries over the course (and as a result of) this grant.

PROJECT OUTPUTS

The main outputs of the project were:

- The **proceedings** of the researcher and stakeholder CAREX LAC workshop held in Bogota in May, 2014. The proceedings summarize the content of the presentations and the discussions that took place at the workshop. It serves as a record of this important milestone towards a regional CAREX for LAC. Importantly, the sections on the current status of CAREX projects in LAC and further research needs are being used by PAHO to track progress and advocate for more resources and investment in occupational cancer research and prevention in LAC.
- A **technical guide** about how to establish a national CAREX project, with a focus on LAC, in English and Spanish (annexed to the workshop proceedings above). The technical guide details the CAREX concept and methodology, with examples of how CAREX has been developed in LAC and Canada. Research challenges identified and described by participants at the Bogota workshop are addressed in the guide. The guide will be used as a practical tool (e.g. for the planned CAREX Caribbean workshop) and as a piece for policy advocacy. It will be available on the IDRC Digital Library, and subsequently posted and freely accessible on the PAHO, OCRC, and CAREX Canada websites.
- **Fact sheets and knowledge packages** on occupational carcinogen exposures in English and Spanish. These products were prepared for the Bogota workshop and focused on exposures and industries common to both Canadian and LAC workplaces. They provided a tactile example of how CAREX data can be combined and communicated for specific purposes and/or for particular target audiences. These resources can be found here:
<http://www.occupationalcancer.ca/2014/strengthening-occupational-carcinogen-surveillance-in-latin-america-and-the-caribbean/>.
- Two **presentations** at large international scientific meetings:
 - Poster presentation at the 50th Anniversary Conference of the International Agency for Research on Cancer, held in June 2016 in Lyon, France. The abstract can be found on the conference website: <http://iarc-conference2016.com/index.php?onglet=21&idUser=&emailUser=&acces=&recherche=odriguez>.
 - Oral presentation at the 25th EPICOH Conference, held in September 2016 in Barcelona, Spain. The presentation was part of an international symposium about estimating exposure to carcinogens in the workplace worldwide. The symposium information and abstract can be found on the conference website: <http://www.epicoh2016.org/12->

[symposia/57-estimating-exposure-to-carcinogens-in-the-workplace-worldwide-opportunities-constraints-and-applications.](#)

- The **designation** of the OCRC as a WHO Collaborating Center in Occupational and Environmental Cancer. This designation reflects and honours our evolving relationship with PAHO and commitment to achieving progress on occupational cancer research and prevention. The designation entails a memorandum of understanding, which sets out mutual goals for the next four years of our partnership. More information about our joint work can be found here: <http://www.occupationalcancer.ca/2016/ocrc-who-collaborating-centre/>.
- **Joining a network** of WHO Collaborating Centres. The OCRC is now officially part of a global network of WHO Collaborating Centres, enhancing knowledge exchange with other institutions worldwide that are focused on occupational cancer. In May 2015, the OCRC attended the 10th Meeting of Global WHO Collaborating Centres in Occupational Health, held in Jeju Island, Korea. The OCRC also participated in a meeting of WHO Collaborating Centres in Sustainable Development and Health Equity in the Americas, which was held in Montreal in September 2015. These meetings have been used to discuss our IDRC-funded work with PAHO and seek opportunities for further international research collaborations.
- Formation of a **CAREX LAC Steering Committee**. The Steering Committee will keep the momentum going for CAREX LAC by providing scientific input, policy recommendations, and technical assistance on CAREX projects and related initiatives, such as occupational cancer research. The Steering Committee is comprised of representatives from the OCRC, CAREX Canada, PAHO, and universities in Colombia and Costa Rica that have taken leadership in their respective CAREX projects and the development of occupational cancer research, policies, and programs for workers. This group will help ensure continuity of the CAREX LAC project.
- **Pr(E) values** on CAREX Canada website (in progress). To aid LAC countries with establishing their own proportion of exposure (Pr(E)) values for individual occupational carcinogens, CAREX Canada is currently assembling its own Pr(E) values by high-level industry and occupation categories that are similar to the way industries and occupations are classified in LAC countries. The methods used to produce these Pr(E) values will be described as well. Additional information, including more detailed Pr(E) values, may be made available by request to CAREX Canada. It is hoped that these values will encourage LAC countries to develop proportions that are appropriate for their working population, rather than adopting values from other jurisdictions that may differ in their occupational carcinogen exposures.

This project meets the requirements of the IDRC's open access policy. The product outputs soon will be publicly and freely available on the project partners' websites. Scientific abstracts are already available on conference websites. We plan on submitting the workshop proceedings and technical guide to the IDRC Digital Library.

PROBLEMS AND CHALLENGES

This project progressed as planned, albeit over a longer period of time than was expected. The main challenge of this grant was ensuring that outputs were produced on time and for multiple purposes in both languages (English and Spanish). There was a delay in producing the technical guide, which was ultimately designed to meet both research and policy advocacy needs. All documents underwent multiple rounds of revision to confirm that the input of all involved (e.g. workshop participants, authors)

was accurate and supported by references where needed. It was important to be detail-oriented so as to not have content “lost in translation” or misinterpreted. Additionally, it was interesting to learn and understand that CAREX projects can be developed by different groups. In Canada and in the European Union, the projects were initiated and sustained by scientists at universities or research institutes who received competitive or non-competitive funding. In LAC, CAREX projects have taken place at universities and government ministries. It is likely that Ministries of Health will play an important role in the establishment of future CAREX projects in LAC.

Participants at the Bogota workshop were supportive of the CAREX approach but emphasized that the lack of occupational hygienists in LAC makes the region-wide adaptation of CAREX very challenging. In many countries, there is a dearth of exposure measurement data and a limited number of hygienists who are available to contribute to exposure assessment as part of a CAREX project. The changing face of the workforce in LAC was also raised as a research issue; namely, informal, temporary, and migrant workers, which are difficult to enumerate and characterize in terms of occupational carcinogen exposure.

A possible challenge related to ethics was the selection of the CAREX approach for estimating population-level occupational carcinogen exposure. The Canadian organizations involved (OCRC and CAREX Canada) made it very clear in all of our interactions and presentations that the CAREX model is a widely-used methodology, but not the only way to address this research gap. It was selected because PAHO, along with many other scientists and organizations internationally, recognize the merits of the CAREX method and its adaptability in different countries. All collaborating organizations encouraged LAC researchers to develop their own exposure estimation models and innovate upon what has been done.

The OCRC’s new partnership as a PAHO/WHO Collaborating Centre is one that we are still learning how to navigate. This designation has prompted us to familiarize ourselves with the WHO’s policies and guidelines for Collaborating Centres, including the use of the PAHO/WHO logo and reporting on our annual joint activities. We are confident that our understanding will improve over time.

ADMINISTRATIVE REFLECTIONS AND RECOMMENDATIONS

This project was a positive experience that helped to cement partnerships between organizations in Canada and LAC and further our mutual research objectives in the field of occupational cancer. It has enriched knowledge sharing and the production of resources that are openly and freely accessible to all.

We are grateful to have received funding from the IDRC for a research issue that is pervasive but chronically underfunded, even in Canada. This grant made it possible to mobilize a long-recognized research need and formalize collaborative relationships. Without this funding, we would not have been able to convene a network of like-minded researchers in LAC and generate resources to sustain and build upon this work into the future.

The funding amount and duration were adequate for a pilot project. We recommend that additional Canadian Partnerships funds should be available (e.g. in a Phase II) to provide larger funds for successful pilot projects. We would have greatly benefitted from more funds to start CAREX Caribbean shortly after the Bogota workshop, for instance. A larger amount of grant money would have also been used to support LAC research gaps, like the training of industrial hygienists and meetings between research teams. We would be happy to discuss any additional opportunities for IDRC funding.