Advances in Mercury Substitution in Mexican Hospitals (2007–2009)

Health Care Without Harm and
El Centro de Análisis y Acción en Tóxicos y sus Alternativas

Commission for Environmental Cooperation

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Health Care Without Harm (HCWH) is an international coalition of over 400 organizations in 52 countries working to transform the health care sector so that it is no longer a source of harm to human beings or the environment. www.noharm.org/

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Table of Contents

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Director of the Center for Analysis and Action on Toxics and their Alternatives (*El Centro de Análisis y Acción en Tóxicos y sus Alternativas*—CAATA), Health Care Without Harm's chief partner in Mexico.

Introduction

This report highlights the main activities executed, the achievements made, the lessons learned and recommendations for further progress regarding mercury substitution in hospitals and health care institutions in Mexico from 2007 to 2009. These activities were carried out by the CAATA, HCWH's chief partner in Mexico, with the support of the Commission for Environmental Cooperation (CEC) of North America, as part of the project, "Partnership project to reduce the use, emissions and spills of toxic substances in the health care sector with an emphasis on mercury."[1]

This project involved holding workshops and training with Mexican health care sector staff, development of plans for mercury reduction and substitution, and implementation of these plans. The 2007, 2008 and 2009 CEC Operational Plans included funding to support these activities for the reduction of mercury in Mexican hospitals.

Funding from the CEC, in combination with funding from the US Environmental Protection Agency and other sources, enabled the broadening of these projects and strengthened the trend towards eliminating mercury in Mexico's health care sector. The work detailed in this document is a consequence of this combination of funding sources, which facilitated taking better advantage of the ongoing experiences of the initial pilot hospitals.

The advances in mercury substitution in Mexico's public health care sector are not only significant in the context of the CEC's regional work, they also have repercussions in terms of World Health Organization (WHO) policy and the negotiations underway to establish a new international convention on mercury, as called for by the United Nations.

In effect, in 2005 the WHO released a general policy document on mercury in which it recommended mercury substitution through short, medium and long term activities.[2] Subsequently, in December 2009 the WHO and HCWH jointly launched an Initiative to Substitute Mercury-based Medical Devices around the World, with the objective of achieving, within the next decade, the virtual elimination of mercury thermometers and tensiometers and their substitution by specific and economically viable alternatives.[3] The majority of the hospitals that collaborated with this project have officially adopted this goal. As has, in particular, the SSGDF, thus making Mexico City the third city in the world to do so—together with Buenos Aires, Argentina, and New Delhi, India. In so doing, Mexico City contributes to one of this initiative's overall objectives.

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[1] In Spanish "Proyecto en Asociación para Reducir el Uso, Descargas y Emisiones de Substancias Tóxicas en el Sector de Cuidado a la Salud en México, con énfasis en reducciones de mercurio."
[2] See World Health Organization document, http://www.who.int/water_sanitation_health/medicalwaste/mercurypolpap230506.pdf.
[3] To learn more about this initiative, its strategy and short- and medium-term objectives, see http://www.mercuryfreehealthcare.org/.

Furthermore in February 2009, the Governing Council of the United Nations Environment Programme (UNEP) called on member nations to conduct negotiations to establish an international legally binding instrument on mercury, which, it is hoped, will be ready for signing in 2013.[4] Mercury use in the health care sector is one of the anthropogenic sources of environmental releases that has been identified at the global level. The results of the mercury substitution activities in Mexico may be considered a modest contribution to national and international discussions in terms of motivating other countries to undertake commitments to engage in mercury substitution via technically reliable and economically viable alternatives.

[4] See http://www.unep.org/hazardoussubstances/MercuryNot/MercuryNegotiations/tabid/3320/language/en-US/Default.aspx.

1. Environmental Mercury Contamination in the Health Care Sector

Mercury is a persistent, toxic, heavy metal which, when released into the environment, readily transforms into methyl mercury, a substance that bioaccumulates in the food chain and may thereby ultimately reach human beings. As such, it represents a risk for human health and the environment.

In its 2005 general policy document, the WHO summarized the health problems caused by exposure to mercury as follows: "Mercury is highly toxic, especially when metabolized into methyl mercury. It may be fatal if inhaled and harmful if absorbed through the skin. Around 80 percent of the inhaled mercury vapor is absorbed in the blood through the lungs. It may cause harmful effects to the nervous, digestive, respiratory, immune systems and to the kidneys, besides causing lung damage. Adverse health effects from mercury exposure can be: tremors, impaired vision and hearing, paralysis, insomnia, emotional instability, developmental deficits during fetal development, and attention deficit and developmental delays during childhood. Recent studies suggest that mercury may have no threshold below which some adverse effects do not occur."

UNEP and the WHO have identified the adverse effects of mercury contamination as a serious problem for the world environment and human health. Moreover, having assessed the impact of environmental releases of mercury, the Governing Council of UNEP has prioritized the reduction of the sources of such releases.[5] Recently, in February 2009 the governments of the world undertook to hold negotiations to prepare a binding international instrument to confront this problem.[6]

Although the health care sector is not a major source of environmental releases of mercury, in contrast to coal-fired power stations or small-scale gold mining, for example, it must assume its environmental responsibilities and contribute to solving the problem. Mercury has been used in instruments for measuring temperature and blood pressure in health care for centuries. That said, because of environmental release of mercury through thermometer and sphygmomanometer breakage or due to the improper management of broken and discarded products that may contain mercury, an environmental contamination problem has arisen with repercussions for human health.

[5] "Exposure to Mercury: A Major Public Health Concern," World Health Organization, 2007, http://www.who.int/phe/news/Mercury-flyer.pdf; UNEP, Global Mercury Assessment, UNEP Chemicals, Geneva, December 2002, http://www.chem.unep.ch/mercury/report/final%20assessment%20report.htm.

[6] Decisions adopted by the Governing Council/Global Ministerial Environment Forum at its twenty-fourth session, UNEP, February 9, 2007; see Decision 24/3, http://www.unep.org/gc/gc24/docs/GC24_decisions.pdf.

2. Mercury Substitution in Two National Health Institutes

The project's activities to phase out and substitute mercury use in Mexico began in 2007 with two National Health Institutes located in Mexico City which enjoy great prestige nationally and internationally: the Federico Gómez Children's Hospital (*Hospital Infantil de México Federico Gómez*—HIMFG) and the National Pediatrics Institute (*Instituto Nacional de Pediatría*—INP). Both have been granted the status of National Health Institutes and are decentralized public organizations with their own legal personalities and corporate assets. They are coordinated at the sectoral level by the Secretariat of Health. This relative autonomy enables them to make internal management and purchasing policy decisions.

The HIMFG was founded in 1943 and provides medical services in addition to being a teaching and research institution affiliated with the National Autonomous University of Mexico (*Universidad Nacional Autónoma de México*—UNAM). The Hospital has a capacity of 212 beds (126 of which are assigned to the hospital proper and 86 to the surgery ward), plus 104 day beds. It has 28 specialized clinics, 130 affiliated doctors and a total of 691 nurses (2008). Its patients are economically disadvantaged children without social security coverage. It treats an average of 153,000 patients per year.[7]

The INP is a post-graduate teaching and research institution that also offers medical care. In 2007, it had a capacity of 235 beds, plus 70 day beds, and employed a total of 2,531 persons, 820 of them nurses, including substitutes. Its pediatricians specialize in numerous medical disciplines. In 2007, it effected 253,030 outpatient consultations. Its patients are children, most of whom are economically disadvantaged and not covered by social security. They are residents of the Federal District and neighboring states as well as, to a lesser extent, other states.[8]

The first activity conducted in both institutions was to hold awareness workshops with guest experts from HCWH on the following topics: the environmental and health risks of exposure to environmental releases of mercury, WHO policy on this issue, international trends in mercury substitution and alternative mercury-free products. In these workshops, it was decided, with the support of the hospital administrators, that 1) preliminary inventories would be done of products containing mercury and 2) preliminary assessments would be made regarding mercury waste management practices and potential discharges into the environment in each hospital. Furthermore, a decision was made to investigate whether any mercury-related purchasing and hospital policies were already in place.

[7] See: http://www.himfg.edu.mx/. The number of nurses is from 2008. The total number of beds that year was 313. See conference given by Ms. Magdalena Franco.

[8] Data obtained from Ms. Silva Balbuena, Assistant Director of Nursing at the INP, and el Informe Anual 2006-2008 y Agenda estadística 2008. See: http://www.salud.gob.mx/unidades/pediatria/masinforma.html.

After sensitizing the authorities, HCWH invited them to sign voluntary letters of commitment on progressively reducing the use of products that may contain mercury, with the ultimate objective of eliminating them, and on the establishing of practices for the proper management of mercury wastes in a uniform manner. Said letter was based on a model letter that was successfully used in Argentina and other countries of Latin America.[9] The then director of the HIMFG, Dr. José Ignacio Santos, signed the letter of commitment to eliminate mercury with HCWH on 31 August 2007. As for the INP, a letter of commitment was signed on 6 September 2007 by, among others, Dr. Juan Pablo Villa Barragán, Director of Planning and Chair of the Hospital Environment Committee (*Comité de Medio Ambiente Hospitalario*—CMAH).

A) Mercury assessment/inventory to determine: existing sources of mercury, waste management practices, and mercury-related purchasing patterns and hospital policies

The general situation we observed in hospitals at the outset of the project's activities was that neither medical nor administrative personnel were aware of the potential environmental or health problems arising from medical personnel's exposure to mercury. There were no special mercury waste management protocols in any of the hospitals, in contrast to biological infectious wastes, for example, for which there exist very specific rules and regulations. Broken mercury thermometers were simply deposited in the sharp objects container and dispatched to an off-site incinerator or cleaned up the same way as any other spill by the janitorial services and deposited in the garbage. In some dentistry departments, mercury residues were kept in a small container with water in accordance with the existing regulations.[10] However, in others, such residues were poured directly into the spit sink of the dentist's chair. Nor was there, in most of the hospitals, an explicit purchasing policy on mercury-free inputs, or any specific mercury-related hospital policies, although in practice mercury substitution was taking place. Hospitals complied with the existing environmental regulations, which are limited with respect to the management of mercury wastes and of products containing same, such as broken and discarded lamps containing mercury.

B) Elaboration of an inventory of products containing mercury and of potential discharges into the environment

In both hospitals, an inventory was done of products, equipment and measuring instruments that contain or may contain mercury. In hospitals, mercury is found in thermometers and sphygmomanometers, and may also be present in fixers, preservatives, lab chemicals, as well as other medical devices, including lamps, which, when discarded, contribute to environmental contamination. **Table 1** indicates the quantities of mercury contained in a selection of instruments and equipment used in hospitals.

[9] See a sample letter in http://www.noharm.org/lib/downloads/espanol/Compromiso_de_Eliminar_Mercurio.pdf.
[10] NOM 013, SSA 2 on the prevention and control of oral diseases, 2006.

Table 1. Approximate quantity of mercury in common instruments and equipment

Mercury in common equipment Compiled by Todd Dresser of the Burlington Massachusetts Health Board	
Building products	***Approximate quantity of mercury***
Fluorescent lighting tubes	10–50 mg per tube, depending on size and model
High intensity discharge lamps	10–250 mg
Thermostats	3 g. per switch (some units have up to 6 switches)
Mercury switches, including: mechanical, level and contact switches	3.5 g per switch
Flowmeters	Often about 5 kg
Flame detectors	3 g
Gas regulators and meters	Old gas meters contain approximately 2–4 g of mercury

Source: *Guía para la eliminación del mercurio en establecimientos de salud*. Salud sin daño. Argentina, 2010.

The inventory of products containing mercury in each hospital enables the identification of priority areas requiring attention as sources of environmental releases of mercury. In every inventory, one thing stands out: the number of mercury thermometers used—and periodically broken due to their frequent use, which necessitates their replacement. Also identified was the poor management of wastes from broken thermometers and the resulting environmental releases along with the attendant risks of mercury exposure for doctors and patients.

For example, in the case of the HIMFG a thermometer breakage rate of 385 per month was documented for the hospital as a whole, i.e., about four thousand broken thermometers per year (see **Table 2**). As the average thermometer contains a gram of mercury, this means that in this category alone 4 kg of mercury wastes are generated per annum. It's worth bearing in mind that pediatric hospitals use a significantly higher number of thermometers than general hospitals.

Table 2. Monthly breakage of thermometers in the Federico Gómez Children's Hospital of Mexico, INS 2007

Departments	**Average number of thermometers broken per month**
Intensive care unit	20
Postoperative recovery	20

Emergency room	30
Outpatient recovery	6
Operating rooms	15
Pediatrics ICU	15
Surgery ICU	15
Nephrology	30
Outpatient services	20
General consultations	30
Day surgery	2
Pediatrics III, IV	15
Pediatrics I, II	30
Immunosuppressive Diseases	30
Chemotherapy	2
Urological surgery	45
Special care	30
Orthopedics	30
Approximate total per year:	**385** **4, 620**

Source: HIMFG 2007 Inventory, HCWH/CAATA

C) Elaboration of a mercury reduction plan and implementation of initial activities

Once a hospital director had given his support and a voluntary letter of commitment had been signed with HCWH, mercury reduction and substitution plans were drawn up through the formation of an ad hoc group in the hospital with the participation of representatives from each hospital department involved in the use or management of mercury: the nursing staff, i.e., the personnel that actually uses mercury thermometers, doctors and instructors, the head of the dentistry department, hospital waste management and hospital administration.

At the HIMFG, the Steering Committee for the drafting and execution of the mercury elimination plan was chaired by the Director of Research and Teaching, Dr. Onofre, and included the various hospital departments involved in the use or management of mercury: nursing, dentistry, teaching, research, hospital waste management and administration.

As for the INP, activities were coordinated via the Environmental Control Department (MVZ). Enrique Garay Garzón, Head of Institutional Development and General Coordinator of the INP's Hospital Environment Committee (CMAH) and biologist Patricia Núñez Vázquez, CMAH Coordinator, organized discussion and planning meetings with the other sectors involved: the nursing staff, dentistry department, laboratory staff, instructors and hospital administration. This is how the Planning Department and the CMAH elaborated a document entitled *"Programa de Reducción y Sustitución de Mercurio en el INP"* ("Mercury Reduction and Substitution Program at the INP"), which includes a strategic plan with courses of action such as the development of an institutional mercury substitution and reduction program, sensitization of different levels of management, the execution of an inventory of mercury sources, comprehensive management of hospital wastes, including the elaboration of a special protocol on the management of minor mercury spills.

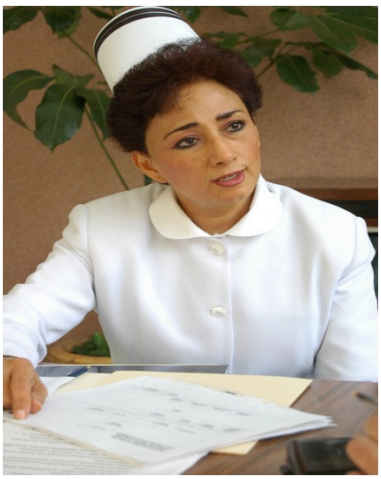
Personal statements

Federico Gómez Children's Hospital of Mexico, National Health Institute
Ms. Magdalena Franco, Assistant Director for Comprehensive Patient Care

"I felt a great sense of commitment and responsibility when I learned that nurses and the health team lacked information on the risks we face when using mercury in thermometers, sphygmomanometers, probes and other devices (…). Learning that this is a highly toxic metal and that we were exposed to it during years of professional service was one of the greatest frustrations I ever had. Now, with this new knowledge, I can take better care of myself, others and the environment."

"*My family and my next-door neighbors no longer use mercury thermometers. We have to spread the message of a mercury-free society through health education to prevent risks to persons and the environment. It would be a great achievement to make the health risks of mercury known at all levels of education, and in all nursing and medical schools. A great achievement."*

National Pediatrics Institute
Ms. Silvia Balbuena, Assistant Director of Nursing.



"*I think the main lesson of this experience in the National Pediatrics Institute is that when we work as a team it's possible to conduct successful campaigns such as the one to reduce and eliminate mercury in hospitals.*

My message to other hospital authorities is that they should form multidisciplinary work teams and allocate specific budgetary resources to pay for inputs to substitute medical equipment, reagents, fluorescent lamps, etc., as well as to pay for inputs in the event of mercury spills."

3. Mercury Substitution at the Secretariat of Health of the Government of the Federal District

Mercury substitution activities at the SSGDF were initially carried out at a pilot hospital and had an impact on the entire hospital system.

Towards the end of 2008, the first awareness workshop was held with the directors of the Pediatrics Hospitals of the SSGDF on the premises of the HIMFG. Moreover, the first official contacts were made to establish a mercury substitution project enjoying official support. After various leadership changes at the SSGDF and among hospital directors, contact was renewed and the SSGDF agreed to participate in the project. As a result, the General Directorate of Medical Services and Emergencies (*Dirección General de Servicios Médicos y Urgencias*) in consultation with the Hospital Services Directorate (*Dirección de Servicios Hospitalarios*) designated the Tacubaya Pediatrics Hospital (HPT) as the site of a mercury substitution pilot project.

It is worth underlining that HCWH's invitation coincided with the Legislative Assembly of the Federal District's request, on 22 May 2009, that the Minister of Health of the GDF report on mercury substitution activities in the Federal District's hospital system, in light of work done in Mexico City in past years by CAATA-

HCWH.[11]

Hospital Infantil de Tacubaya

The Tacubaya Pediatrics Hospital (Zona Metropolitana del Valle de México) was founded in 1961 and is administered by the the Secretariat of Health of the Government of the Federal District (*Secretaría de Salud del Gobierno del Distrito Federal*—SSGDF). It specializes in the treatment of general burns and infected burns, as well as emergencies, nursing infants, respiratory therapy, orthopedics, neonatology, general and plastic surgery. It has a total capacity of 85 beds (including 22 day beds) and employs 380 persons. It has a total nursing staff of 135, including substitute nurses.[12]

The initial training and sensitization activities at the HPT led to the forming of a Mercury Substitution Committee in July 2009 with the participation of the Hospital Director and representatives from the following departments: nursing, teaching and research, dentistry, hospital administration, and janitorial services. Under the leadership of the Head Nurse, this committee carried out a mercury use assessment and inventory and conducted training activities on dealing with minor mercury spills.

This assessment identified a situation similar to the one prevailing in the National Health Institutes where HCWH had previously worked: no awareness of risk among nurses and janitorial services personnel, no specific cleanup protocols, nor any instructions on the specific labeling and the proper management of mercury wastes, as distinct from hospital wastes in general.

The training of nursing staff on the risks of mercury exposure and environmental releases resulted in more careful handling of mercury thermometers and a reduction in the number of broken thermometers. Thus, in 2009, from January to June 416 mercury thermometers were broken. However, the average daily breakage rate fell from 3.5 thermometers in January of 2009 to 1.6 in June of the same year. Breakage was reduced further still as only 33 thermometers were broken in the following six months, resulting in a total of 449 thermometers broken that year.

Concerning the management of mercury wastes from broken thermometers, the Head Nurse of the HPT developed a flowchart and a specific procedure that was submitted to the *Jefatura General de Enfermería* (College of Nurses) for review and subsequently forwarded to all SSGDF hospitals. Thus, in the event of a spill, the nurse shall advise the janitorial services personnel, restrict movement in the area, ventilate the area and bring from the Equipment and Sterilization Center (*Central de Equipos y Esterilización* or (CEYE) a mercury clean up kit to the site of the spill so that janitorial personnel may proceed with the clean up in accordance with the prescribed instructions and safety measures. Due to the rotation of personnel employed by janitorial services contractors, it is necessary to ensure regular training of such personnel along with training of nurses.

[11] Legislative Assembly of the Federal District, IV Legislature, 22 May 2009, MDDPSRTA/CSP/243/2009.
[12] Interview with Reyna Flores, Head Nurse, Tacubaya Pediatrics Hospital.

As for the overall management of mercury wastes, broken thermometers and residues from amalgams, etc., a specific procedure on the separation and labeling of mercury wastes was adopted with the support of the Operations Coordinator of the SSGDF's Office of Hazardous Industrial Wastes (*Oficina de Residuos Peligrosos Industriales*—ORPI). Mercury wastes from broken devices are separated, labeled and temporarily deposited in the HPT's storage area for CRIT (*Corrosives, Reagents, Inflammables and Toxics*) wastes.

While there was a small initial donation of 25 digital thermometers from CAATA-HCWH to kick off the substitution activities, it was thanks to the SSGDF's support that 110 digital thermometers were purchased at the end of November 2009 for use at the HPT. This enabled the withdrawal of 95 functioning mercury thermometers, 80 from the Equipment and Sterilization Center and 80 broken thermometers, which were safeguarded in the CRIT wastes storage area. The Hospital achieved 100 percent substitution of mercury thermometers by digital thermometers in February 2010. As for sphygmomanometers, the HPT only had one containing mercury. It was replaced by four aneroid devices. Esophageal dilators are not used in this hospital.

The most important result of the HPT's substitution pilot project was its impact on the entire SSGDF hospital system. This was achieved thanks to the leadership of the Hospital Services Coordination Authority (*Coordinación de Servicios Hospitalarios*), which formed, with the support of the General Directorate of Medical Services and Emergencies (*Dirección General de Servicios Médicos y Urgencias*), a team that included the SSGDF's Head Nurse, the environmental advisor of the hospital wastes management department, and representatives from the HPT and CAATA-HCWH. This served to coordinate dissemination and information activities on the advances made in the HPT's substitution pilot project throughout the entire hospital system via meetings with the directors of each hospital and their nursing and administrative personnel.

When the Minister of Health of the Federal District, Dr. Armando Ahued, accepted the invitation to join the joint HCWH and WHO Global Initiative to substitute mercury thermometers and sphygmomanometers this decision furnished the institutional support needed to extend the mercury use inventory activities and the awareness and training activities initiated at the HPT to the entire SSGDF hospital system. Moreover, the SSGDF implemented internal administrative measures regarding its purchasing policy in order to substitute mercury thermometers with digital ones throughout the hospital system.

The SSGDF hospital system had 29 hospitals in 2009. This number increased to 31 hospitals in 2010 and includes 10 pediatrics hospitals, 13 general hospitals (including one specialized hospital) and 8 maternal-infant care hospitals, with a total capacity of 2,950 beds, plus 3,460 day beds.[13] The SSGDF system also includes 5 prisons and 2 juvenile centers (see **Appendix A.5**), as well as the Public Health Services of the Federal District (*Servicios de Salud Pública del Distrito Federal*—

[13] See http://www.salud.df.gob.mx/ssdf/hospitales/index.php.

SSPDF), which comprises 250 public centers.

Impact on the SSGDF Hospital System's Purchasing Policy

Although the SSGDF had not purchased mercury sphygmomanometers since 2007, the results of the HPT's substitution pilot project and the decision to join the WHO-HCWH Global Initiative led to a decision to move towards a mercury-free purchasing policy via the acquisition of digital thermometers, aneroid sphygmomanometers and lamps for use with photocurable resins via the actions detailed below.

As a result of the actions of the Under-secretariat of Medical Services and Supplies (*Subsecretaría de Servicios Médicos e Insumos*) oral and rectal mercury thermometers were withdrawn from the Federal District's Institutional Catalog of Medicines and Supplies. Thus, as of 2010 it was no longer possible to purchase these two mercury-based devices in the entire hospital system of the Federal District. Consequently, based on the 2009 purchasing statistics, in 2010 an estimated total of 57,641 mercury thermometers were *not* purchased (39,346 oral thermometers and 18,295 rectal thermometers).

In its Annual Operating Plan of 2010, the SSGDF programmed the acquisition, for its hospitals, of 8,606 digital thermometers, 12,097 aneroid sphygmomanometers and 38 lamps for use with photocurable resins. With these measures, the SSGDF has set itself the objectives of 100 percent substitution of mercury thermometers with digital ones in its hospitals and 90 percent substitution of mercury sphygmomanometers with aneroid models in these same institutions. The SSGDF's goals for 2012 are 1) to incorporate all SSGDF health centers in the mercury substitution program and 2) recover 100 percent of the lamps containing mercury in the medical services units located in its prisons.[14]

4. Sensitization and Training Activities on Mercury Management and Substitution in Hospitals

In coordination with the hospitals, a number of sensitization and training workshops were carried out between 2007 and 2009. These targeted the sectors exposed to mercury, including nurses, doctors, janitors and administrative personnel. Furthermore, teams were formed to visit hospitals which had already initiated better mercury management and substitution activities to promote information sharing. International seminars with domestic and foreign experts were organized and a series of training and information pamphlets were produced, as were videos and posters.

The following topics were among those covered in information pamphlets: the health and environmental risks associated with mercury, the proper use of digital

[14] Conference given by Dr. Angélica Martínez Huitrón, 23 July 2010. SSGDF Auditorium.

thermometers and cleaning up minor spills. Other printed information was produced including posters on the mercury reduction and elimination program, and information for hospital patients. (See Appendix 3 for a comprehensive list of the materials produced.)

It's important to highlight the impact of video materials in training—particularly the video in which one can see the volatilization of mercury at room temperature thanks to ultraviolet light.[15] This has a big impact in that it makes it possible to visualize something which in reality is invisible and imperceptible to the naked eye. That changes the perception of risk among exposed nursing and medical personnel, which, in combination with the information disseminated in training workshops by domestic and foreign experts, has a considerable educational impact.

The hospitals with the means to produce their own videos as training materials on cleaning up minor mercury spills and on the risks posed by mercury demonstrated creativity and initiative. Particularly outstanding was the work of the Mexican Center for Health Education through Television (*Centro Mexicano de Educación en Salud por Televisión*—CEMESATEL) at the HIMFG. CEMESATEL produced two training videos and disseminated mercury substitution activities in the weekly programming of channel 27 of the EDUSAT network, which is broadcast in 538 medical institutions in Mexico and 19 countries of Latin America,[16] as well as via issues 11 & 12 of *Ixtilton*, the HIMFG's house publication.

As for international training events and conferences, "*la Conferencia Internacional sobre Sustitución y Reducción del Uso del Mercurio en el Sector Hospitalario*" ("International Conference on Mercury Substitution and Reduction in the Hospital Sector") had a major impact. This event was held on 30 June and 1 July 2008 in Mexico City in the HIMFG's auditorium with the participation of Mexican and international experts and over 300 participants from 50 hospitals from the national capital as well as other parts of the country.

As for the SSGDF, it organized a national meeting on mercury substitution in hospitals in Mexico, 5–6 November 2008, to publicize the progress made at the HPT and the health system of the Federal District as a whole. Among those in attendance were every hospital director in the SSGDF, head nurses and administrative personnel. Also present at this meeting were representatives of the PAHO-WHO in Mexico, Ms. Martha Delgado, Environment Minister of the Federal District Government, representatives of Semarnat, the CEC and other hospitals that are members of the HCWH in Mexico from Chihuahua, Guerrero, Sonora and the Federal District.

It's worth underlining that training has a multiplier effect when it is given by a team with leadership and motivation. This is the main reason why the head nurses

[15] The video in question is 53 seconds long and was made at Bowling Green University, OHIO, by EPA and Rader Environmental and is available with Spanish subtitles at http://www.noharm.org/salud_sin_danio/temas/toxicos/mercurio/. Go to the section "Recursos" and download "Video Vapores de mercurio."

[16] Updated information from CEMESATEL at http://www.himfg.edu.mx/interior/cemesa.html.

of the HIMFG, the INP and the HPT were invited to speak at other hospitals and in nursing schools.

PERSONAL STATEMENT
Tacubaya Pediatrics Hospital
Reina Flores Flores, EMI nurse and Head Nurse

It made a big impression on me when I learned of mercury's health effects and I thought about the number of years I've been working. I also thought about all of the nurses—and their families—who've been exposed to this toxic [substance]. Disseminating knowledge among health care professionals and hospital authorities, as well as to the health care system as a whole, on the health risks of mercury and how to prevent them left me with a feeling of great satisfaction because I felt that I was warning health care professionals and that in so doing I was reducing the risks of illness. The main mission of nurses is precisely that, preventing illness. And when it comes to your colleagues or workplace family this is something you do with much greater enthusiasm.

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5. Cleanup of Minor Mercury Spills

With technical advice from HCWH, a kit was devised for cleaning up minor mercury spills that has been used mainly for broken oral thermometers as each hospital implemented its mercury substitution measures (see Appendix A.4). Some kits were donated to hospitals. However, the materials they contain are inexpensive and already in use in hospitals (syringes without needles and adhesive tape, for example). As such, they are readily available.

In coordination with the committee or group formed in each hospital or institution, users instructions were developed for the minor spills cleanup kit. These instructions have undergone constant improvement over time. Both the HIMFG and the INP developed their own users instructions, as did the SSGDF.

There were differences among the hospitals regarding which personnel would be responsible for the proper cleanup of minor mercury spills. In the HIMFG and the INP it was decided that nurses would assume this task, after receiving proper training, in coordination with the hospital department responsible for managing

hospital wastes to ensure the proper labeling of said wastes and their temporary storage. In the case of the SSGDF's Tacubaya Pediatrics Hospital, it was decided that the personnel of the companies subcontracted for janitorial services would do the cleanup work, after training from the Operations Coordinator of the SSGDF's Hazardous Wastes Program and in coordination with the nursing staff, which developed a detailed flowchart and procedure. It's important to emphasize that periodic training is required due to the rotation of the janitorial personnel employed by subcontractors.

In both cases, the period of time the minor spills cleanup kits will be in use shall depend on how long it takes to replace and substitute mercury thermometers. Depending on the availability of resources, it is recommended that the substitution of mercury thermometers with digital ones be as rapid as possible to reduce both the environmental impact and the need to train cleanup personnel.

6. Reduction and Substitution of Mercury Amalgam Use in Hospitals

The amalgams dentists use as material to fill cavities are an alloy composed of elemental mercury (50 percent) plus other metals in powder form (silver accounts for 69 percent of the remaining 50 percent, while the remainder is composed of different combinations of tin, copper and zinc). Amalgam residues constitute a hazardous waste due to their mercury content and require special management to avoid mixing them with other hospital wastes or flushing them down the spit sink where they enter the drainage system and contaminate the food chain in rivers and other bodies of water. The cremation of bodies containing amalgams is another source of environmental release of mercury.

Representatives from the dentistry departments in the hospitals where we worked participated in the committees or groups created to discuss mercury reduction and substitution measures. It is worth noting that regarding the management of mercury wastes from amalgams, NOM-013-SSA2-2006 only specifies that these should be stored in water in airtight plastic containers.[17] In every hospital, measures were implemented to ensure the proper separation and management of amalgam residues. As for the partial or complete substitution of amalgams in dentistry, policies varied from hospital to hospital.

In the HIMFG, the use of mortars to mix and prepare amalgams was completely eliminated. As a substitute, pre-dosed mercury tablets were introduced as a supplementary option should a dentist opt to not use resins.[18]

Amalgams have been completely eliminated at the INP and have not been in use since 2008. Similarly, the HPT has also decided to cease using amalgams and adopted photocurable resins as a substitute. Moreover, the INP decided to

[17] NOM-013-SSA2-2006, "Para la prevención y control de enfermedades bucales" ("For the prevention and control of oral diseases," Diario Oficial de la Federación, paragraph 7.3.4.4.
[18] Resins, or composites, as they are also called in English.

incorporate this substitution of amalgams by photocurable resins into a general mercury-free purchasing policy that also covers thermometers and sphygmomanemeters. As a result, special halogen lamps were purchased for use with this type of resin starting in the second quarter of 2010. It is hoped that this measure will produce the gradual substitution of amalgams in all 28 of the SSGDF hospitals with dentistry departments, a process that will require monitoring and training.

Other aspects were not included in the project's activities, which, however, are worth considering in future activities. In addition to the environmental problems caused by poor management of the mercury residues in amalgams, other health risk issues arise from the fact that amalgams constantly release mercury vapors, although this is not visible to the naked eye. Dentists and their patients are exposed to these releases. Even in the case where dentists have stopped using amalgams, it would be appropriate to adopt safety protocols on the removal of amalgams and thereby avoid workplace exposure for dentists and dental assistants, as well as over exposure for patients and environmental releases. To this end, it would be pertinent to review the recommendations of specialized organizations such as the International Academy of Oral Medicine and Toxicology (IAMOT), among others, and adapt them to the context in Mexico.[19]

Personal statement
Dr. Javier Gutiérrez Martínez, Head of the Dentistry Department
Tacubaya Pediatrics Hospital
Secretariat of Health of the Government of the Federal District

"We took on the task of investigating the harm caused by mercury vapors since this metal is a very important component in amalgams. We also updated our knowledge of the new materials used with esthetic considerations in mind in order to practice up-to-date dentistry. We also became conscious of the risks to which we are exposed through mercury exposure, given that in an average month a dental surgeon puts in 40 amalgams, not to mention the ones removed and replaced.

As a result, we reached a consensus among the team of dentists here, and also obtained support of the hospital administration, concerning a mercury-free environment for the good of the personnel and the patients of the Tacubaya Pediatrics Hospital."

[19] See the International Academy of Oral Medicine & Toxicology (IAOMT) at www.iaomt.org and the series of educational videos produced by Laytondental: http://www.youtube.com/watch?v=m6YGS4SjW4o.

7. Safe Storage of Hospital Wastes Containing Mercury and Their Final Disposal

As described in the section on the cleanup of minor mercury spills, the participating hospitals implemented specific procedures on the proper cleanup and separation of mercury wastes in hospitals, including mercury lamps and amalgam residues, with such wastes to be consigned to the hazardous wastes storage area. However, they found themselves facing the problem of the under-development of the market for processing these particular types of waste as well as legal restrictions on the permissible period for the storage of hazardous wastes, as we explain below.

Wastes containing mercury are considered hazardous wastes in accordance with Official Mexican Standard NOM-052-Semarnat-2005.[20] Moreover, the General Act for the Prevention and Comprehensive Management of Waste (*Ley General para la Prevención y Gestión Integral de los Residuos*—LGPGIR)[21] states that generators of hazardous wastes are legally bound to develop and execute plans for the proper management of said wastes and of products that become hazardous wastes when discarded at the end of their useful lives. Said plans must include the stockpiling, storage and transport of hazardous wastes for recycling, processing or final disposal.

According to the current legislation on hazardous wastes, once these have been collected and stored in containers, they must be consigned to the hazardous wastes storage area where they may be kept for a maximum period of six months, as stipulated under Art. 84, with a single six month extension permitted, pursuant to Art. 65 of the LGPGIR.[22]

It should be noted that under the current environmental legislation mercury wastes may not be disposed of in liquid form. Such wastes must either be processed or stabilized. However, the majority of companies authorized to collect and process hazardous wastes offer neither a metallic mercury removal service nor proper processing for its final disposal. As for the collection of mercury lamps, only recently have companies begun to offer this service and it is expected that the supply of same will increase should the demand for such collection services develop. For this to occur a more aggressive information campaign aimed at the generators of mercury wastes in the health care sector is required. Such a campaign would entail concerted action on the part of Semarnat and the Secretariat of Health.

[20] NOM-052-Semarnat-2005 which establishes the characteristics, identification procedure, classification, and registries with respect to hazardous wastes, Diario Oficial de la Federación, 23 June 2006.
[21] LGPGIR, published in el Diario Oficial de la Federación, 8 October 2003 and amended on 19 June 2007.
[22] Diario Oficial de la Federación, 30 Nov. 2006.

At the HIMFG, 7 liters of liquid mercury were collected from broken thermometers, amalgams and wastes stored in past years. However, the HIMFG confronted the problem that the company that provided it with hazardous wastes collection services did not include mercury among the wastes removed for such a small quantity and did not guarantee stabilization processing after its consignment for final disposal.[23] As many micro-generators of mercury wastes may find themselves confronting this problem, we recommend that it be properly attended to by Semarnat in coordination with the Secretariat of Health.

As for the INP, the disposal of hospital wastes containing mercury in compliance with the applicable regulations was integrated into the 2007 and 2008 Work Programs, as was the inclusion in the Comprehensive Hospital Wastes Management Plan of said disposal activities.[24] The mercury collected by the INP was removed by the company it contracted for the collection of hazardous hospital wastes during 2008.

In June 2009, Semarnat asket CAATA-HCWH and other stakeholders to participate in a working group to address the problem of what to do with mercury removed from hospitals. Other members of the group included hospital institutions of the public health system in Mexico (IMSS, ISSTE), the hospitals participating in HCWH activities, and officials of the Secretariat of Health and the Office of the Federal Attorney General for Environmental Protection (*Procuraduría Federal de Protección al Medio Ambiente*—Profepa). As part of this effort the CEC supported the development of a Comprehensive Management Plan on the Removal of Mercury and Wastes Containing Mercury in the Health Care Sector (*Plan de manejo integral para el retiro de mercurio y residuos que lo contienen en el Sector Salud).* This plan, completed in 2010 serves as a guide to be periodically updated and adoped by institutions participating in mercury reduction and removal activities in the country.

In the HPT, activities to ensure the proper management of mercury wastes were executed in coordination with biologist Yeni Betzabet Ayala Fernández from the SSGDF's Office for Hazardous and Industrial Wastes (*Oficina de Residuos Peligrosos e Industriales*—ORPI), a participant in the working group organized by Semarnat. Towards the end of 2010, it was hoped that one of the companies authorized to dispose of hazardous wastes would undertake to collect liquid mercury, amalgam and mercury lamp wastes and ensure that such wastes are properly processed before they are disposed of or recycled, in coordination with the company contracted to effect hazardous wastes collection by the SSGDF for the hospital system as a whole.[25]

[23] The HIMFG notified Semarnat of this situation and requested a further extension of the original six month extension for the storage of these wastes. This request was denied and the HIMFG was instead invited to participate in the working group to discuss this situation. However, this problem remains unresolved.

[24] INP, Programa "Sustitución y Reducción de Mercurio," Comité de Medio Ambiente Hospitalario, 2007.

[25] Conference paper given by biologist Yeni B. Ayala on 11 October 2010.

8. Results of the Training and Mercury Substitution Activities in Other Hospitals

The activities to disseminate the advances in mercury substitution also enjoyed the support of other Mexican members of HCWH such as the "*Salud, Trabajo y Ambiente*" ("Health, Work and the Environment") network of academic bodies, which includes nine public sector universities. Meeting in the city of Chihuahua, Chihuahua, this network estimated the quantity of environmental mercury releases to be 5.5 tons per year in the health care dentistry sectors at national level. It made a statement in favor of mercury substitution in Mexico's health care sector at its meeting of 25–29 June 2007.[26]

In 2007, from the 1 to 15 October, awareness workshops on mercury in the hospital sector were held in three Mexican states: Guerrero, Chihuahua and Sonora. These workshops included the participation and collaboration of HCWH Mexico staff members, CAATA personnel and Dr. María Della Rodolfa from the HCWH coordination team in Argentina. These workshops were held in *el Hospital Infantil e Integral de la Mujer del Estado de Sonora* (the Women's General and Pediatrics Hopital of the State of Sonora), in Hermosillo, Sonora, *el Hospital Infantil de Chihuahua* (the Children's Hospital of Chihuahua) in the capital of the state of Chihuahua, and in *la Clínica Hospital de Subzona N° 5 del Instituto Mexicano del Seguro Social* (IMSS Hospital Clinic of Sub-zone No. 5), in Taxco, Guerrero, with the participation of medical and nursing personnel from other hospitals.

These workshops served to motivate the authorities and medical and nursing personnel regarding the risks of environmental releases of mercury and mercury substitution options. This enabled HCWH members to carry out followup activities in 2008 and 2009, and thus encourage further progress in terms of substitution commitments. As a result, considerable progress was achieved, particularly in Chihuahua, thanks mainly to the leadership of Dr. Martín Cisneros. In Chihuahua, six hospitals have, to date, signed a letter of commitment to gradually substitute mercury. Among them are IMSS hospitals, as well as hospitals of the Chihuahua Institute of Health (*Instituto Chihuahuense de Salud*) or the State Health Services of Chihuahua (*Servicios Estatales de Salud de Chihuahua*). Other signatories of letters of commitment include a Family Medicine Unit (*Unidad de Medicina Familiar*) in Chihuahua and the City of Chihuahua, although in the latter case, no concrete steps have been taken to implement the commitment.

In Guerrero, training was given to members of the Nursing Network for Environmental and Occupational Health (*Red de Enfermería en Salud Ambiental y Ocupacional*), which includes five hospitals—the Adolfo Prieto Hospital (*Hospital Adolfo Prieto*) and the IMSS Family Medicine Hospital Clinic of Sub-zone No. 5 (*Clinica Hospital de Subzona Numero 5 con Medicina Familiar del IMSS*), both in Taxco de Alarcón, IMSS Family Medicine Hospital Clinic of Sub-zone No. 4 in Iguala (*Clínica Hospital de Subzona Numero 4 con Medicina Familiar del IMSS de Iguala*), the Raymundo Abarca Alarcón General Hospital (*Hospital General Raymundo*

[26] Conference paper given by Dr. Luz Helena Sanín,investigator of the "Health, Work and the Environment." Academic Network.

Abarca Alarcón) and the Guerrero Mothers' and Children's Hospital (*Hospital de la Madre y el Niño Guerrerense*), both in Chilpancingo—plus three nursing schools of the Autonomous University of Guerrero (*Universidad Autónoma de Guerrero*), i.e., Taxco, Chilpancingo and Iguala. However, despite the efforts made to this end not a single hospital from this state signed a letter of commitment. The explanation given: this constitutes a decision to be made by state authorities due to the centralized nature of purchasing.

In Sonora, Dr. Mabeth Burgos Hernández from the Center for Advanced Studies of the State of Sonora (*Centro de Estudios Superiores del Estado de Sonora*—CESUES) in Hermosillo, Sonora, obtained support for the execution of a sensitization project in the hospitals on Mexico's northern border region with the United States (mainly in Sonora) in 2010.

Training activities were also carried out at the Advanced Care Medical Unit of La Raza National Medical Center (*el Centro Médico Nacional La Raza, Unidad Médica de Alta Especialidad*—UMAE) and the IMSS' Gynecology-Obstetrics Unit 3, in Mexico City on 15 June 2009. As a result, UMAE Director, Dr. Oscar Arturo Martínez Rodríguez, signed on the very same day a voluntary letter of commitment with HCWH on gradual mercury substitution.

9. Conclusions

- Thermometers and sphygmomanemeters containing mercury can be replaced by technically effective and economically viable alternatives in Mexico's hospitals in the short term.
- The joint WHO and HCWH global initiative to substitute mercury thermometers and sphygmomanometers encourages the voluntary participation of hospital authorities and is gaining institutional support for the strengthening and broadening of pilot substitution projects.
- In hospitals or health care institutions, in addition to the institutional support of the authorities in favor of mercury substitution, it is necessary to include all sectors involved in the management and purchasing of devices containing mercury through the forming of a committee or group in charge of the issue. Said group may include medical, nursing and, where applicable, dentistry personnel, as well as administrative and janitorial services staff to carry out assessment and training activities and to supervise mercury substitution activities in hospitals. In this manner, planned activities are made effective, all points of view are considered, and all areas subject to mercury exposure, as well as all sources of environmental releases, are in fact covered.
- It is important to conduct systematic training activities on the risks of mercury use, proper mercury waste management and mercury-free alternatives. The use of a video to show mercury volatilization is the key to changing risk perception on the part of exposed personnel; similarly, face to face exchange of experiences among exposed sectors, particularly among nursing personnel, is important for increasing motivation.

- Doing an inventory on mercury use and the management of mercury wastes in each hospital is a good first step in obtaining a proper assessment, particularly on the use and breakage of oral and rectal mercury thermometers, as well as for calculating the economic and environmental costs that this implies in comparison with viable alternatives.
- Regarding the cleanup of minor mercury spills, it is important to coordinate the nursing staff, the janitorial services personnel and the department responsible for managing hospital wastes with respect to training and the management of mercury wastes to ensure that these are stored separately and labeled in accordance with the proper protocols. If maintenance and janitorial services are contracted out, it's important to ensure followup and periodic training in the event of personnel rotation.

10. Recommendations

- The Secretariat of Health and the competent organizations at the federal level should establish a public sector purchasing policy on mercury-free thermometers and sphygmomanometers at the national level.
- Once a few pilot hospitals have successfully demonstrated the viability of mercury substitution in the country and its advantages, it will be important to promote the adoption of public policies at the state and federal levels that enable more rapid elimination of mercury throughout the health sector, both public and private, as well as perhaps in households where medical devices containing mercury are also in use.
- We recommend that the appropriate authorities at Semarnat and the Secretariat of Health carry out a national information campaign aimed at hospitals and health care centers on the risks of the environmental release of mercury and on mercury substitution alternatives.
- Include in the curricula of nursing, medical and dental schools information materials on 1) the environmental risks and the health risks of exposure to mercury and 2) alternatives to mercury-based medical devices.
- We recommend that the competent authorities at Semarnat ensure wide dissemination of the guide on developing mercury wastes management plans in the hospital sector in order to update knowledge based on experience acquired in Mexico and to ensure that the recommendations of competent international organizations are taken into account to avoid the risk of adopting processing technologies that generate new contaminants.
- Establish coordination mechanisms with the Semarnat authorities responsible for Mexico's pollutant release and transfer register (*Registro de Emisiones y Transferencia de Contaminantes*—RETC) at the federal and state levels and with the Government of Mexico City in an information campaign specifically targeting generators of mercury wastes in the health sector. Such a campaign would emphasize the need to include inventories of broken thermometers, lamps and other instruments and equipment containing mercury to ensure proper reporting of the wastes generated and thus facilitate more precise reporting to the RETC as well as induce greater supply in the mercury wastes cleanup and processing services market.

- Explore the introduction of measures to broaden the responsibility of manufacturers, or the introduction of voluntary programs for manufacturers of fluorescent lamps containing mercury, in respect of the systematic collection of discarded lamps containing mercury for recycling or their proper final disposal.
- It is important that the authorities participating in the negotiation of the future international convention on mercury called for by the United Nations coordinate with the competent authorities of Semarnat and the Secretariat of Health to highlight the advances made in Mexico and to extend mercury substitution efforts at the national level.
- In hospitals that have made a mercury substitution commitment and in those that have yet to do so it may be deemed appropriate to implement safety protocols for the safe removal of amalgams in order to reduce workplace exposure to mercury vapor among dentists, as well as excessive exposure among patients and environmental releases. This would constitute a complementary measure to the proper disposal of amalgam residues. In this regard, it would be pertinent to review the recommendations of specialized organizations such as the International Academy of Oral Medicine and Toxicology, for example.

Appendices

A.1. Characteristics of Digital Thermometers, as recommended by Health Care Without Harm

Automatic memory of last reading
-Automatic shutdown
-Beep codes
-Resistance to disinfectants commonly used in health care establishments
-Precision of measurement: +/- 0.1 °C
-Measurement range: 32.0 °C to 43.9 °C
-Video display for easy readings
Mercury-free battery, preferably silver oxide, with an operating life guarantee of over 200 hours of continuous use
-Protective cover (optional)
-One-year guarantee from day of purchase
Certifications, one of the following: 1.- Clinical medical use digital thermometer for body temperature measurement 2.- European Union approved: CE 0118-LMET-80-04-0118/Q 3.- Compliance with European Standards DIN EN ISO 9001:2000, DIN EN 12470-3:2000 and EN 60601-1 and Good Manufacturing Practices

A.2. List of Hospitals that have signed Health Care Without Harm's Letter of Commitment or Participated in the Joint HCWH-WHO Global Initiative for the Gradual Substitution of Mercury in Mexico

	Hospital Infantil de México Federico Gómez, Instituto Nacional de Salud, Cd. de México
	Instituto Nacional de Pediatría, Cd. de México
	Hospital Infantil del Estado de Chihuahua, Instituto Chihuahuense de Salud (ICHISAL)
	Instituto Chihuahuense de la Salud, Hospital Central del Estado, Gobierno del Estado de Chihuahua
	Hospital General Regional No.1, Delegación Estatal de Chihuahua, Instituto Mexicano del Seguro Social (IMSS)
	Hospital Regional de Cd. Delicias. Chihuahua
	Hospital Central Universitario, ICHISAL, Chihuahua
	Centro Médico "Lic. Adolfo López Mateos," Toluca, Edo. de México. Instituto de Salud del Estado de México (ISEM)
	Centro Médico Nacional La Raza, Unidad Médica de Alta Especialidad (UMAE) Ginecoobstetricia Num. 3 IMSS. Cd. de México
31	Secretaría de Salud del Gobierno del Distrito Federal (SSGDF) Includes 31 hospitals and 250 Public Health Centers
	Total

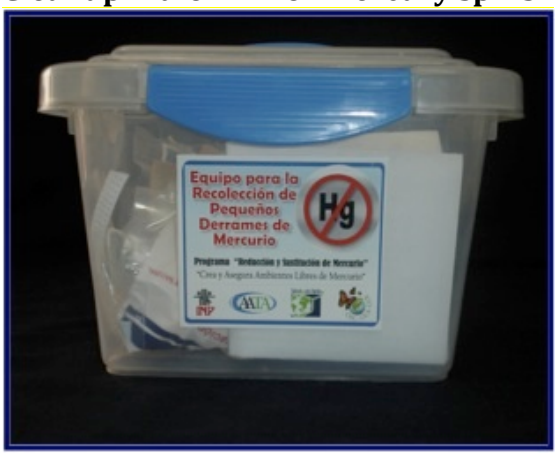
A.3. List of Materials developed by Hospitals in Coordination with the CAATA and Health Care Without Harm from 2007 to 2010

Hospital Infantil de México Federico Gómez	• Information pamphlet on mercury for hospital personnel • "*El mercurio y los daños al la salud*" ("How Mercury Harms Health"), an information pamphlet for patients • Flyer with instructions on the proper use of digital thermometers • Flyer with instructions on cleaning up minor mercury spills
Hospital Infantil de México Federico Gómez and CEMESATEL	Videos: • "*Limpieza y disposición de pequeños derrames de mercurio*" ("Cleanup and disposal of small mercury spills") Duration: 6 min. • "*Mercurio en los hospitales. Introducción a los problemas causados por el mercurio en los hospitales*" ("Mercury in hospitals: introduction to the problems caused by mercury in hospitals"). Duration: 0:04:03 • "Phasing out mercury in the hospital sector: overall policy and experience in the United States." Conference given by Dr. Peter Orris at the National Pediatrics Institute on 6 Sept. 2007. Duration 0:46:38
Instituto Nacional de Pediatría	• Pamphlet entitled "*Programa: Sustitución y Reducción de Mercurio en el INP*" ("Program: Mercury Substitution and Reduction at the INP") • Pamphlet entitled "*Limpieza de pequeños derrames de mercurio. Programa Reducción y Sustitución de Hg"* ("Cleaning up minor mercury spills - Hg Reduction and Substitution Program") • Poster with information on the Hg reduction and elimination program • Poster with information on the mercury cycle
Secretaría de Salud del Gobierno del DF Hospital Pediátrico de Tacubaya	• Flyer entitled "*Guia para la recolección de pequeños derrames de mercurio*" ("Guide on cleaning up minor mercury spills")
Hospital Pediátrico de Tacubaya	Video: "*La experiencia de recolección de pequeños derrames de mercurio en el Hospital Pediátrico de Tacubaya*" ("Cleaning up minor mercury spills: the experience of the Tacubaya Pediatrics Hospital"), duration: 0:9:40, April 2010

A.4. Minor Mercury Spills Cleanup Kit

- Ziplock type airtight bag
- Thick transparent bag
- Thin tube or small plastic recipient with airtight cap
- Latex gloves
- Paper towel
- Strips of cardboard
- Syringe without needle or dropper
- Adhesive tape
- Flashlight
- Markers

Cleanup kit for minor mercury spills:



A.5. List of Hospitals Administered by the Secretariat of Health of the Government of the Federal District (SSGDF)

Hospitals	Official no. of beds	Supplementary beds
H Especialidades Belisario Domínguez	142	66
General Hospitals		
HG Ajusco Medio	n.a.	n/d
HG Balbuena	185	39
HG Enrique Cabrera	114	72
HG Gregorio Salas	50	60
HG Iztapalapa	144	4
HG Milpa Alta	44	23
HG Rubén Leñero	121	62
HG Tepepan	185	39
HG Ticomán	79	49
HG Villa	150	65
HG Xoco	199	22
Maternal-Infant Hospitals		
HMI Cuajimalpa	35	12
HMI Cuautepec	54	19
HMI Inguarán	94	38
HMI Magdalena Contreras	26	3
HMI Nicolás M. Cedillo	16	105
HMI Tláhuac	38	68
HMI Topilejo	30	21
HMP Xochimilco	90	59
Pediatrics Hospitals		
HP Azcapotzalco	16	3
HP Coyoacán	64	38
HP Iztacalco	70	12
HP Iztapalapa	71	20
HP Legaria	n/d	n/d
HP Moctezuma	80	64
HP Peralvillo	49	7
HP San Juan de Aragón	59	3
HP Tacubaya	63	22
HP Villa	66	24

Source: Secretariat of Health of the Government of the Federal District (*Secretaría de Salud del Gobierno del Distrito Federal*—SSGDF)
(n.a.) data not available. HG Ajusco Medio and HG Tepepan are recently opened facilities and only provide emergency room services at this time.
http://www.salud.df.gob.mx/ssdf/hospitales/index.php