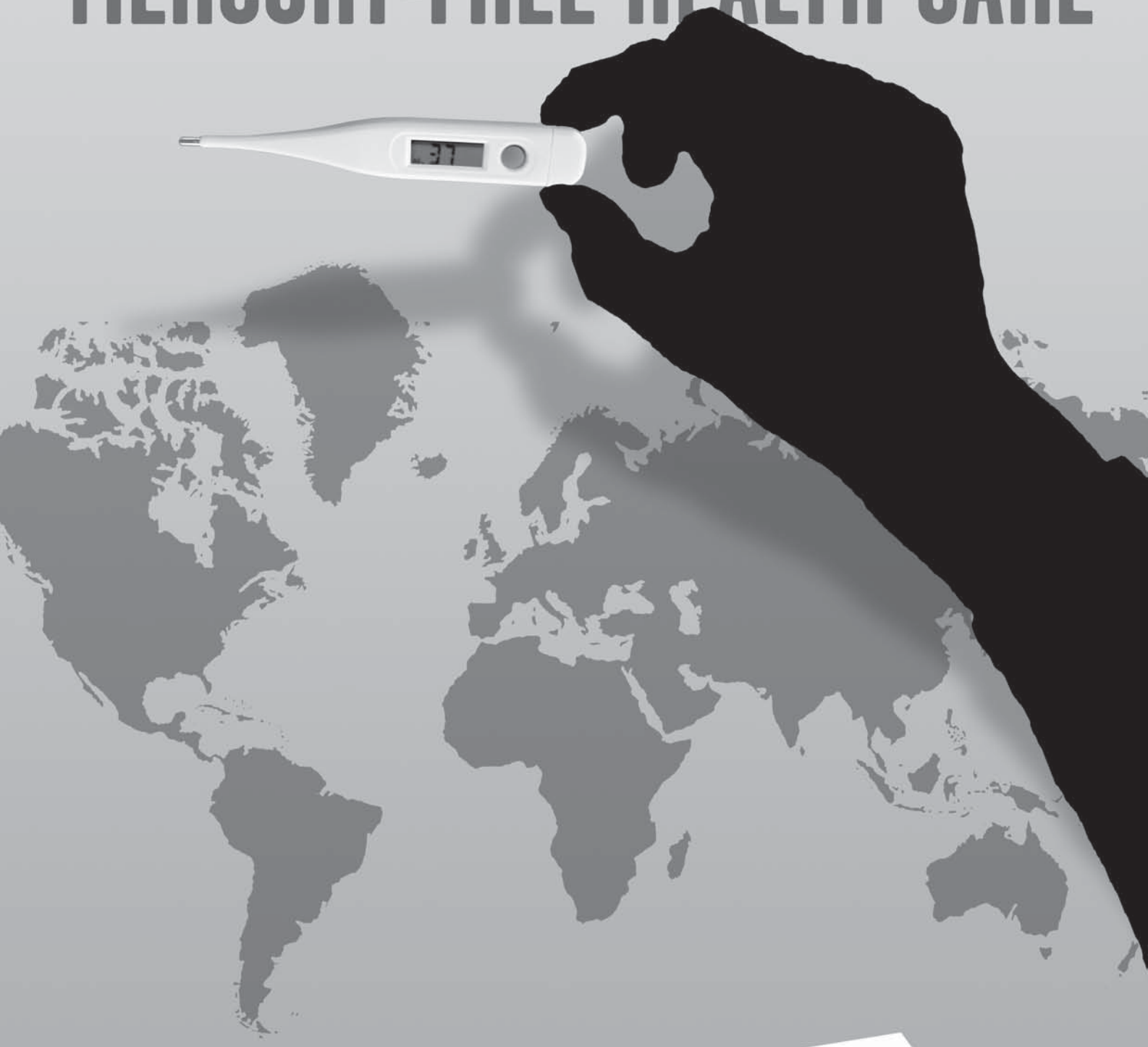
THE GLOBAL MOVEMENT FOR MERCURY-FREE HEALTH CARE



How health care leaders around the world are substituting mercury-based medical devices with safer, environmentally sound alternatives.

THE GLOBAL MOVEMENT FOR MERCURY-FREE HEALTH CARE

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Health Care Without Harm

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A Health Care Without Harm Publication

Health Care Without Harm is a global coalition of more than 440 organizations in 52 countries working to assure that that the health care sector is no longer a source of harm to human health or the environment.

www.noharm.org

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By substituting mercury-based medical devices with safer alternatives, health care providers can help minimize their sector's impact on the environment and on human health itself.

Photo: Juan Manuel González

Health care leaders can be key spokespeople and advocates for change. Neonatal intensive care unit nurses receive their first digital thermometers, Santisima Trinidad Children's Hospital, Cordoba, Argentina.

INTRODUCTION

The uses of mercury have been reduced significantly in many industrialised countries. Alternatives are commercially and competitively available for most uses. However, these reductions in use have had the effect of lowering demand relative to the supply of mercury, which has kept mercury prices low and encouraged ongoing (and in some cases, increased) use of mercury and outdated mercury technologies in less-developed regions or nations. As mercury regulations and restrictions are less comprehensive or less well enforced in many less-developed regions, these trends have contributed to the concentration, in these areas, of a disproportionate burden of some of the health and environmental risks that accompany mercury.

United Nations Environment Programme, Global Mercury Assessment, 2002

All societies are faced with the challenge of providing quality, affordable healthcare. As the relationship between human health and environmental contamination or degradation has become increasingly clear, societies must now also consider this dimension.

As it turns out, one of the most important steps health care providers can take is to minimize their own sector's impact on the environment and therefore on human health itself. Such considerations are increasingly coming into play in the selection of healthcare products, such as temperature or blood pressure measuring devices that contain the global pollutant, mercury.

In this regard, Health Care Without Harm has worked in collaboration with health care providers, government agencies, non-governmental organizations, and others since 1996, to facilitate the substitution of mercury-based medical devices with affordable, accurate and safer alternatives. This concern has met with increasing and widespread acceptance within health care institutions around the world.

In the United States, thousands of hospitals, pharmacies and medical device purchasers have voluntarily switched to digital thermometers along with aneroid and digital blood pressure devices. Thirteen U.S. states have also legislated bans on mercury thermometers. Together, these initiatives have had the effect of fundamentally transforming the U.S. health care sector, moving it away from mercury,and shifting its purchasing power toward safer alternatives.

In Europe, several countries, including Sweden, the Netherlands, and Denmark have all banned the use of mercury thermometers, blood pressure devices and a variety of other equipment. In 2007, the European Parliament legislated a ban on mercury thermometers throughout the European Union.

Since 2006, efforts in the Global South –Asia, Africa and Latin America– have grown by leaps and bounds. Today, hundreds of hospitals in developing countries have committed to going mercury-free, and a number of large cities, states, and national governments have developed policies that could serve as models.

Such initiatives are bolstered by the World Health Organization's policy on mercury in health care, issued in 2005 (see box). They also are supported by and feed into the Mercury Program of UNEP-the United Nations Environment Programme. This initiative is designed to raise awareness of the global environmental hazards of mercury, while exploring solutions through voluntary partnerships and a possible legally binding agreement.[1]

This report documents the state of the global movement toward mercury-free health care by describing the relevant issues, the challenges the health care sector faces in replacing mercury-based medical devices, and a series of successes--including pilot projects and policy models that are already achieving meaningful change on the ground.

Based on the findings contained in this report, a vision of mercury-free health care on a global level becomes clear. However, much remains to be accomplished. Only if health care leaders, governments, UN agencies and NGOs around the world join together to achieve this phase-out, will we reach our goal of making a major contribution to the environmental health of the planet, and the billions of people living on it.

EXECUTIVE SUMMARY

MERCURY IN THE ENVIRONMENT

■ Mercury causes a variety of significant adverse impacts on human health and the environment. Methyl mercury pollution is a global contaminant that causes serious health and environmental harms.

■ The United Nations Environment Programme (UNEP) has identified mercury pollution as a major environmental and human health problem, and has targeted reducing methyl mercury accumulation in the global environment as a major priority.

MERCURY IN HEALTH CARE

■ The health care sector is a key source of global mercury demand and emissions.

■ Mercury is found in many health care devices, including fever thermometers, blood pressure cuffs, and esophageal dilators. It is present in fluorescent lamps and dental amalgam, as well as many chemicals and measurement devices used in health care laboratories.

■ The health care sector emits mercury waste into the environment when any of these devices are spilled or broken. Health Care generated mercury waste enters the global environment via incineration, solid waste disposal or waste water.

■ In most hospitals in developing countries, patients and health care workers are regularly and unknowingly exposed to dangerously high levels of mercury; there is regular and ongoing breakage of thermometers and the lack of mercury waste management protocols.

■ Mercury waste from broken fever thermometers is significant. For instance, thermometers used and broken in Argentina's health care sector emit an estimated 1 metric ton of mercury per year. The estimate for Mexico is similar. For India, it is 2.4 metric tons.

■ These spills and breakages create a hazardous hospital environment for patients and health care workers alike, while contributing to the global mercury load.

■ The mercury-based medical device industry is a major polluter. In China, which produces more than 150 million mercury thermometers per-year, more than 27 metric tons of mercury are lost to the environment before the devices ever leave the factory.

CHALLENGES OF SWITCHING TO ALTERNATIVES

■ It is in the interest of public health and the environment to replace mercury-containing measuring devices in the health care sector.

■ There are many mercury-free thermometers and sphygmomanometers available from major medical equipment suppliers who service the global market.

Accuracy

■ Peer reviewed literature from the last decade shows that digital thermometers and aneroid sphygmomanometers are just as accurate as mercury-based devices.

■ Mercury and non-mercury thermometers and blood pressure devices provide accurate measurement so long as instruments are calibrated.

■ It is imperative that the healthcare community and governments ensure that alternative devices are purchased from manufacturers that follow techniques and testing protocols that are independently certified.

Affordability

■ Mercury thermometers are less expensive then the digital alternative. However, in hospitals with frequent mercury thermometer breakages, when the cumulative costs of thermometers is compared with the cost of a digital or mercury-free alternative, the digital device becomes economically viable.

■ In Argentina, Brazil, Europe, Mexico, South Africa and the United States, health care systems are breaking even or saving money by switching to non-mercury devices.

■ In Asia, where there is a greater cost differential between mercury and alternative devices, a diversity of strategies are being employed to make the switch.

Disposal

■ Hospitals can solve their greatest mercury waste and acute mercury exposure problems simply by replacing mercury thermometers with digital alternatives. If mercury is not used, spills will not occur.

■ Several short-term options exist for safe storage of waste from mercury devices that are taken out of use, the ongoing collection of dental amalgam waste, and waste from digital thermometer batteries.

■ Options include on-site storage, extended producer responsibility, national regulations, collection programs, and global guidelines.

■ There is no simple solution to the mercury waste problem. The preferred scenario is one where mercury and mercury-containing products are no longer used, and the mercury in use is collected and no longer returned to the marketplace in products.

MERCURY-FREE HEALTH CARE AROUND THE WORLD

■ The **World Health Organization** has issued a policy paper calling for short, medium and long term measures to substitute mercury-based medical devices with safer alternatives.

■ Over the past decade the **United States** health care sector has virtually phased out mercury-based medical devices. It is virtually impossible to purchase a mercury thermometer in the United States today.

■ The **European Union** has banned mercury thermometers for home and health care use beginning in 2008. The EU is considering a similar ban on sphygmomanometers.

Growing numbers of hospitals in developing countries are moving toward mercury-free health care

■ In **Argentina** more than 28 hospitals have completely switched to mercury-free thermometers. Twenty-nine more and several clinics have committed to change over to mercury-free thermometers and blood pressure devices.

■ In Sao Paulo, **Brazil**, more than 92 hospitals have signed agreements committing to eliminate mercury-based thermometers and sphygmomanometers--more than 42 have already done so.

■ Two hospitals in **China** and two hospitals in **Mexico** are taking the first steps toward mercury substitution in those countries.

■ In **India**, five hospitals have piloted mercury-free health care.

■ In the **Philippines** more than 50 hospitals are moving toward mercury-free health care.

Model policy initiatives are emerging in developing countries

LARGE CITIES: The Buenos Aires city government, which runs the largest health care system in Argentina, is implementing a policy to phase out mercury-based medical devices in 33 major hospitals and 38 smaller health care centers.

PROVINCE/STATE: The Province of Kwa Zulu Natal, South Africa has issued directives banning the purchase of mercury thermometers and spygmomanometers.

NATIONAL: The Phillippines is developing an Administrative Order to phase out mercury in health care nationally. Cuba has replaced neary all of its mercury column sphygmomanometers with aneroid devices on a national level.

SHIFTING SUPPLY

The Chinese environmental protection agency, SEPA, suggests that the "key to reduce the mercury consumption by medical devices is to accelerate the development of mercury-free…substitute products of high quality and low price."

SEPA recommends a series of measures that China, the largest producer of mercury-based medical devices in the world, can take. If these recommendations were implemented, a fundamentally dirty industry could be transformed into a much cleaner, more sustainable one, providing affordable, accurate alternatives to the world.

CONCLUSIONS ENVISIONING MERCURY-FREE HEALTH CARE

■ Health care leaders can be key spokespeople and advocates for mercury elimination and environmental health-not just in hospitals-but throughout our societies.

■ If the right political and economic forces converge, the day is not far off when, in most hospitals around the world, mercury-based medical devices will be a thing of the past.

■ As efforts to substitute mercury-containing medical devices increase, the alternatives market will grow, and the economies of scale for the alternative devices will also increase, bringing their price down.

■ Strategically placed bilateral and multilateral aid could help assure and hasten the transition in the health care sector by providing support for shifting both supply of, and demand for alternative devices.

■ The development of an ongoing a small-to-medium sized grants program to promote awareness raising, health care worker training and the purchase of alternative equipment is essential.

■ Also necessary is financing for appropriate long term storage and disposal of mercury waste, including dental amalgam byproducts.

■ Mercury will still remain a serious threat to global environmental health so long as its trade and movement is unfettered in the world economy. For this reason, many health care leaders have agreed to "advocate for a legally binding international instrument…so as to substantially reduce the global mercury supply and demand."

PART ONE
THE PROBLEM

MERCURY IN THE ENVIRONMENT

Mercury is a naturally occurring heavy metal. At ambient temperature and pressure, mercury is a silvery-white liquid that readily vaporizes. When released into the air, mercury may stay in the atmosphere for up to a year, and is transported and deposited globally. It is within this environment that inorganic and organic compounds of mercury are formed.

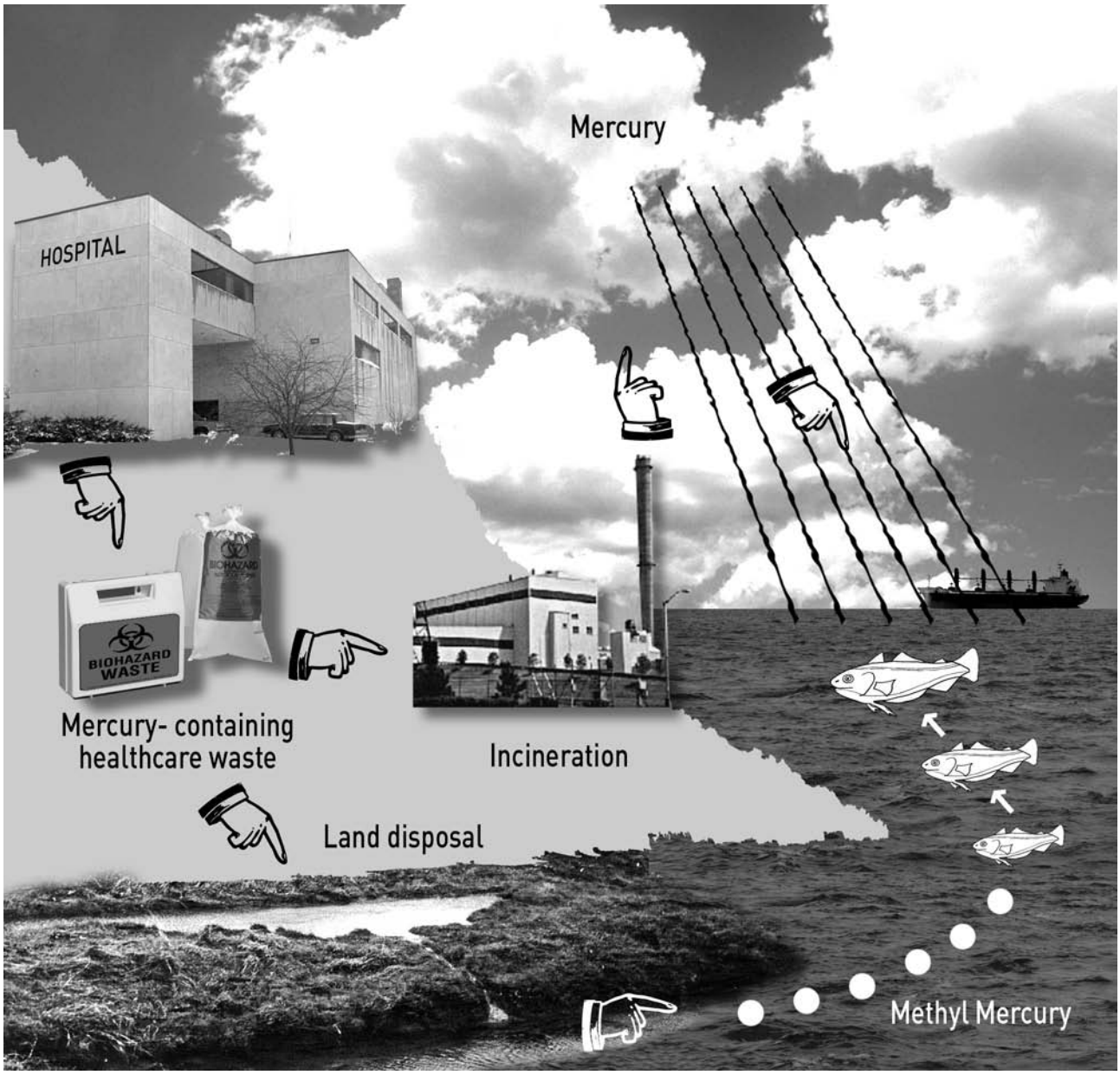
Since the start of the industrial era, the total amount of mercury circulating in the world's atmosphere, soils, lakes, streams and oceans has increased by a factor of between two and four.[3] This increase has been affected by human endeavours, which include the removal of mercury from its subterranean home through mining and the extraction of fossil fuels. Human exposure to mercury can result from a variety of sources, including, but not limited to, consumption of fish rich in methyl mercury, and due to spills or leaks of the metallic element itself.

Mercury causes a variety of significant adverse impacts on human health and the global environment. Mercury vapor may be fatal if inhaled, and harmful if absorbed through the skin due to direct exposure to the liquid or its vapors. Hospitals from Manila to Mexico City report regular and frequent breakage of thermometers, causing continuing exposure to staff and patients. The mercury vapors released by these accidents cause immediate and potentially life threatening lung damage at high doses and harmful effects to the kidneys, nervous, digestive, respiratory, and immune systems at lower doses.[4]

Of even more concern is that the toxicity produced by methyl mercury can manifest at exquisitely low levels. Mercury accumulates in lake, river, stream, and ocean sediments, where it is transformed into methyl mercury, which can then accumulate in fish tissue. Methyl mercury is a global contaminant that causes serious health and environmental harm. It is widely present in oceans and lakes, building up in predator fish at the top of the aquatic food chain, and in shellfish in all parts of the world. The mercury levels of these fish can be millions of times higher than the levels in surrounding water.[5]

Methyl mercury is of special concern for fetuses, infants, and children because it impairs neurological development. When a woman eats seafood that contains mercury, it accumulates in her body, requiring several years to excrete. If she becomes pregnant within this time, her fetus is exposed to methyl mercury in the womb, which can adversely affect her baby's growing brain and nervous system. Impacts on cognitive thinking, memory, attention, language, and fine motor and visual spatial skills have been seen in children exposed to low levels of methyl mercury in the womb.[6]

The United Nations Environment Programme (UNEP) and World Health Organization have identified the adverse effects of mercury pollution as a serious global environmental and human health problem.[7] The UNEP Governing Council has targeted reducing methyl mercury accumulation in the global environment as a major global priority.[8]



Mercury from health care and other industries accumulates in lake, river, stream and ocean sediments, where it is transfored into methyl mercury, which then moves up the aquatic food chain.

WHO Policy Paper

Recognizing the impacts of mercury on human health and the contribution of the health care sector to this problem, the World Health Organization issued a policy paper in September 2005, providing guidance to countries and health care institutions on substituting mercury-based medical devices with safer alternatives. The policy paper consists of the following short, medium and long term measures.

Short Term: Develop and implement plans to reduce the use of mercury equipment and re place it with mercury-free alternatives. Address clean-up, storage and disposal.

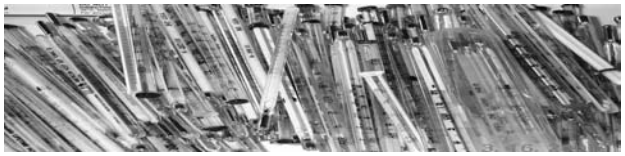
Medium Term: Increase efforts to reduce the use of unnecessary mercury equipment in hospitals.

Long Term: Support a ban of mercury-containing devices and promote alternatives.[2]

MERCURY IN HEALTH CARE

The health care sector is far from the greatest source of mercury in the environment. Rather, coal-fired power plant emissions and mercury cell chlor-alkali plants, along with artisanal gold mining and battery disposal are all far more significant polluters.

However, the health care sector still does play an important role as a key source of demand for mercury and global emissions, as well as a source of low-level, chronic and acute mercury poisoning. At the same time, health care leaders can be key spokespeople and advocates for change– not just in hospitals, but throughout our societies.



Mercury can be found in many health care devices, including fever thermometers, blood pressure cuffs, and esophageal dilators. It is present in fluorescent lamps. Dental amalgams account for a major contribution to the global mercury load. Mercury is also found in many chemicals and measurement devices used in health care laboratories. If any of these products are spilled, broken or disposed of improperly, there is a potential for significant harm to human health and the environment.[9]

For instance, medical waste incinerators, as well as municipal waste incinerators, emit mercury into the atmosphere when they burn wastes that contain mercury, thereby directly contributing to the global mercury load. According to the U.S. Environmental Protection Agency (EPA), in 1996, prior to the mercury phase-out in U.S. health care, medical waste incinerators were the fourth largest source of mercury emissions to the environment. Hospitals were also known to contribute 4-5% of the total wastewater mercury load. Mercury fever thermometers alone contributed about 15 metric tons of mercury to solid waste landfills annually.[10]

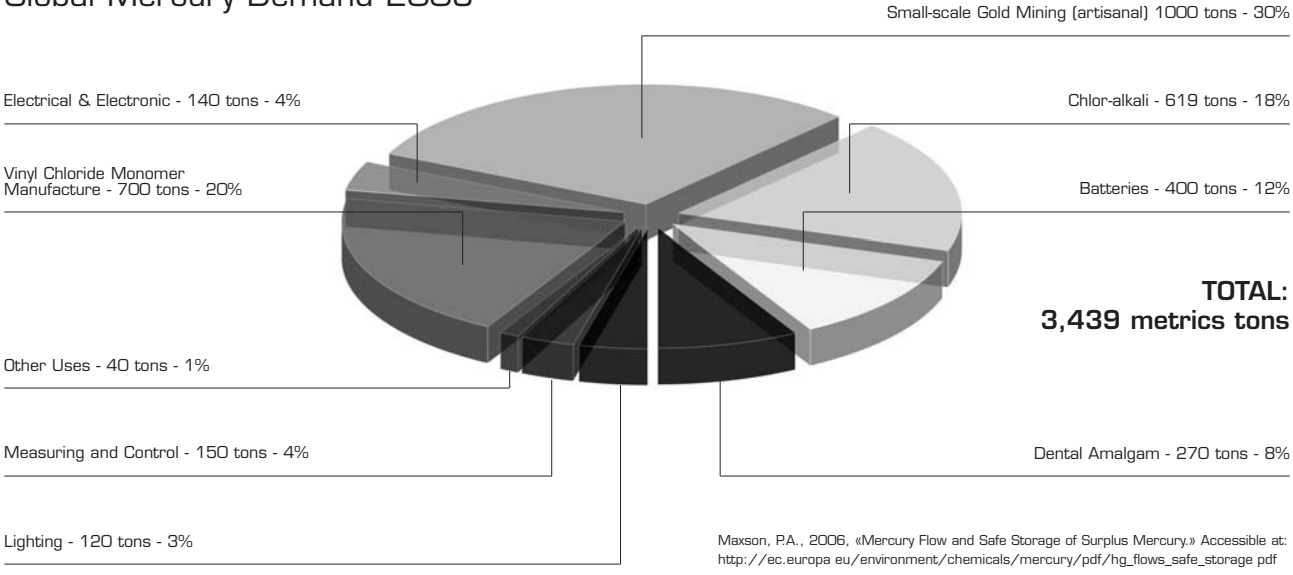
While no comprehensive figures are available, anecdotal evidence suggests that in most of Asia, Africa and Latin America, mercury spills are not properly cleaned, nor is the waste segregated and managed properly. Rather, it is either incinerated, flushed down the drain, or sent, via solid waste, to a landfill.

Thermometer breakages on a case-by-case basis pose some harm to patients, nurses and other health care providers when mercury is absorbed through the skin or mercury vapor is inhaled. Only a relatively small amount of mercury –roughly one gram– is released when each thermometer breaks. However, when taken cumulatively on a hospital ward, in an entire hospital, nationally and globally, the situation takes on more serious dimensions.

In Buenos Aires, for instance, the city government, which runs 33 hospitals and more than 38 clinics, was purchasing nearly 40,000 new thermometers a year, until it began to switch over to alternatives in 2006.[11] Given that nurses and other health care professionals often buy their own thermometers to supplement the city's procurement, the city's health system was using well over 40,000 thermometers a year, most of which would break, and some of which would be taken home (where most would ultimately break as well). The system was ultimately emitting in excess of 40 kilograms of mercury into the local hospital environment and into the global ecosystem every year.

If one were to use this figure and extrapolate for the entire country, one can estimate that until recently thermometers broken in Argentina's health care system were spilling 826 kilos, or nearly 1 metric ton of mercury, into the global environment every year.[12]

Global Mercury Demand 2005



Maxson, P.A., 2006, «Mercury Flow and Safe Storage of Surplus Mercury.» Accessible at: http://ec.europa eu/environment/chemicals/mercury/pdf/hg_flows_safe_storage pdf

Photo: Joshua Karliner/HCWH

Medical waste incineration is a major source of airborne mercury emissions, dioxins and furans around the world.

In Mexico City, the 250-bed "Federico Gomez" Children's Hospital is a medical service, teaching, and research hospital affiliated with the National Autonomous University of Mexico. Working with Health Care Without Harm's Mexico partner, the Center for Analysis and Action on Toxics (CAATA), this prestigious children's hospital documented a thermometer breakage rate of 385 per month, or well over 4,000 per year (see Table 1). The total number of estimated broken thermometers in this one hospital between 2002 and early 2007 is nearly 22,000 –the equivalent of 22 kilograms of mercury.[13]

Pediatric hospitals use significantly more thermometers than general hospitals. For instance, figures from a 215 bed general hospital in Hermosillo, show a purchase rate of 9.6 thermometers per bed per year, much lower than Federico Gómez children's hospital.[14]

If one were to take this conservative figure and extrapolate for all of Mexico, which has 103,000 acute care hospital beds, one can estimate that the country's health care sector, as a whole, is responsible for breaking 988,800 mercury thermometers per year, thereby spilling nearly one ton of mercury into the hospital environment, and ultimately releasing it into the global environment annually.[15]

While the Federico Gómez hospital has now committed to substituting its mercury devices with alternatives, when it undertook its initial assessment with HCWH and CAATA, there was no clean-up protocol for mercury spills. Rather, mercury waste was deposited with either infectious and biological hazardous wastes, or with municipal wastes. Broken fluorescent lamps were also treated as municipal waste. Mercury containing equipment was not repaired if broken, and the procedure followed was to merely register the loss and replace it with new equipment.[16]

Mercury spills in hospitals not only contribute to global pollution, but also pose an acute toxic hazard to health care workers and patients.

Most hospitals in developing countries suffer ongoing thermometer and sphygmomanometer breakages, but have no safety or clean-up protocols. Rather, mercury waste is dumped, flushed or burned.

Photo: India, Toxics Link

Mercury release and contamination from sphygmomanometer calibration is a common problem throughout the world.

The regular and ongoing breakage of thermometers and the lack of mercury waste management protocols and practices found at the Federico Gómez hospital is not an exception. Rather, it is a common scenario in hospitals throughout much of the Global South, where patients and health care workers are regularly and unknowingly exposed to dangerously high levels of mercury.

For instance, in India, where far fewer thermometers are employed in many hospitals (a 2004 study revealed that on average, 70 thermometer breakages occur per month in a typical 300-500 bed hospital[17]), HCWH's partner organization Toxics Link found dangerously high levels of mercury in a series of indoor air samples. They found the "substantial presence of mercury in ambient air of both the hospitals" studied. These levels, which ranged from 1.12 microgram per cubic meter to 3.78 microgram/m3, were all higher than numerous international standards.[18]

If one were to extrapolate the Toxics Link thermometer breakage figures to India as a whole, which has roughly 1 hospital bed for every 1,000 people, the country breaks nearly 2.4 million thermometers annually. As a result, the Indian health care sector may be releasing as much as 2.4 metric tons onto hospital floors throughout the country and into the global environment every year from thermometers alone.[19]

TABLE 1

Monthly Mercury Thermometer Breakage at Federico Gomez Children's Hospital, Mexico City

Services	broken per month
Intensive care unit	20
Postoperatory recovery	20
Emergency Room	30
Out-patient studies recovery	6
Surgery	15
Pediatric ICU	15
Surgery ICU	15
Nephrology	30
External consultation	20
General consultation	30
Out-patient surgery	2
Pediatrics III, IV	15
Pediatrics I, II	30
Immunosuppressive illnesses	30
Chemotherapy	2
Urological surgery	45
Special care	30
Orthopedics	30
Total:	**385**
Approximate yearly total:	**4,620**

Source: HCWH/CAATA, 2007

One of the biggest mercury hot spots that Toxics Link found in its study was the room used to calibrate blood pressure devices (sphygmomanometers), which contain 80-100 grams of mercury or 80-100 times the amount found in a single fever thermometer.

Mercury release and contamination from sphygmomanometer calibration is a common problem throughout the world. Louis Havinga, Manager of Health Technology Services for the Kwa Zulu Natal Province Department of Health in South Africa explained to HCWH partner organization groundWork:

> This is the most important point why the Health Technology Services has moved away from the use of mercury products. The technicians were exposed to mercury when they repaired mercury column sphygmomanometers. Special precautions and equipment is needed if working with mercury products like a dedicated fume/vapour extraction unit within the maintenance department. The mercury is extracted from the device and placed in a special marked container. The container must be able to seal and should remain inside the fume/vapour extraction unit. Once the container is full, the container must be disposed of in a well documented and controlled manner by making use of a recognized hazardous waste disposal company which is very costly.

And while sphygmomanometers break less frequently than thermometers, the spillage is significant and therefore problematic from an environmental health perspective. At the Mayo Clinic in the U.S., between 1993 and 1995, 50 spills were documented relating to leakage and spills from sphygmomanometers.[20] Havinga continues:

> Although mercury is classified as a hazardous substance there was little knowledge how to deal with mercury spillage in a clinical area.…Mostly the institutions dispose of the mercury products in a hap hazardous manner and could expose the public and service provider staff to mercury contaminated devices. These contaminated devices could end up in landfills and pollute the environment.[21]

Mercury-based medical devices are not only hazardous in the hospital setting, but also pose a danger in the home. For instance, the Toxicology Unit of the Gutierrez Hospital, a pediatric hospital in Buenos Aires, Argentina, receives an average of 15 calls a month regarding mercury poisoning. Most of these calls are regarding broken thermometers in the home.[22]

A HAZARDOUS INDUSTRY

The Production of Mercury-based Medical Devices

Today, most mercury thermometers are produced in China, with India also producing a small but significant percentage of the total. A recent report by China's environmental protection agency, SEPA and the U.S.-based Natural Resources Defense Council (NRDC), shows that the country is producing an increasing number of mercury-based medical devices for both domestic consumption and export.

Eight factories in China produced 150 million thermometers in 2004 –a 20 percent increase from the year 2000. In the process, these factories ran through nearly 200 metric tons of mercury. Meanwhile, mercury sphygmomanometer production in three factories increased nearly 50 percent in the same time period, to 1.5 million in 2004. (See Table 2a) Overall, this production made up about 10% of China's total mercury consumption.[23]

Roughly 40% of all thermometers –or 60 million devices– are exported from China, mostly to Southeast Asia, Latin America and Africa, with a small amount entering the U.S. and European markets (see Table 2b)[24]

By comparison, Hicks, an Indian company, produces about 570,000 mercury thermometers annually for domestic consumption. This makes up roughly 50 percent of the Indian market.[25]

In addition to spillage in a health care or home setting, the production of mercury thermometers and sphygmomanometers themselves pose serious occupational health and safety hazards to factory workers, as well as local and global pollution problems. The best documented case in this regard is that of Kodaikanal, India.

In 1983, Cheesborough Ponds corporation relocated a factory from New York U.S. to the lakeside tourist destination of Kodaikanal in Southern India's Palani Hills. The factory produced mercury thermometers primarily for the U.S., European, South American, and Australian markets. In 1998, Hindustan Lever, a subsidiary of the Anglo-Dutch corporation Unilever, bought the factory and ran it until it was closed down in 2001.

Data from when the plant was operational report levels of airborne mercury well above internationally recognized safety limits. Not surprisingly, a series of serious mercury-related occupational health problems have been reported by former workers at the plant, including fatigue, headaches, nausea, skin complaints, respiratory dysfunction, kidney dysfunction and more. Once it was closed, the plant and its surrounding areas, including the local lake, were found to be contaminated with high levels of mercury. Meanwhile, offsite, mercury laden waste was sold to other businesses, including 7.4 tons to a local scrap dealer-thereby spreading the pollution.[26] Ultimately, the company was compelled to ship back about 285 tons of mercury waste to the original suppliers of mercury in the United States. More than 5,000 tons of contaminated soil remains at the factory site, while offsite contamination

in some places is so serious that it triggers national hazardous waste clean-up criteria.[27]

What is clear from this example, is that a great deal of mercury employed in the thermometer production process never makes it to the hospital, but rather ends up as hazardous local and global pollution. As the SEPA/NRDC report observes, a significant amount of the mercury "consumed by the thermometer manufacturing industry in China is lost to the environment" before the thermometers even leave the factory.[28]

Assuming one gram of mercury in each thermometer, based on tables 2a and 2b below, thermometer production facilities in China are spilling more than 27 metric tons of mercury into the environment every year.[29]

TABLE 2 (a)

Total Mercury Consumption in Thermometer and Sphygmomanometer Production in China 2003-2005

Year	2003	2004	2005
Sphygmomanometers (Kgs)	51,736	94,872.6	81,484.4
Thermometers (Kgs)	169,609	185,325	200,907.9

Source: CRC/NRDC, May 2007.

TABLE 2 (b)

Production and Export of Mercury-containing Thermometers from China 2003-2005

Year	2003	2004	2005
Total Production (ten thousands)	14309	15820.5	17363
Export (ten thousands)	5500	6325	7000
Domestic Sales (ten thousands)	8809	9495.5	10363
Percentage by Export (%)	38.4	39.8	40.3

Source: CRC/NRDC, May 2007.

Photo: Sheweta Narayan

Mercury bottles dumped outside the thermometer factory in Kodaikanal India. More than 5,000 tons of contaminated soil remain onsite.

China produces 150 million mercury thermometers a year –both for domestic consumption and export.

In the process, its factories annually spill more than 27 metric tons of mercury into the environment.

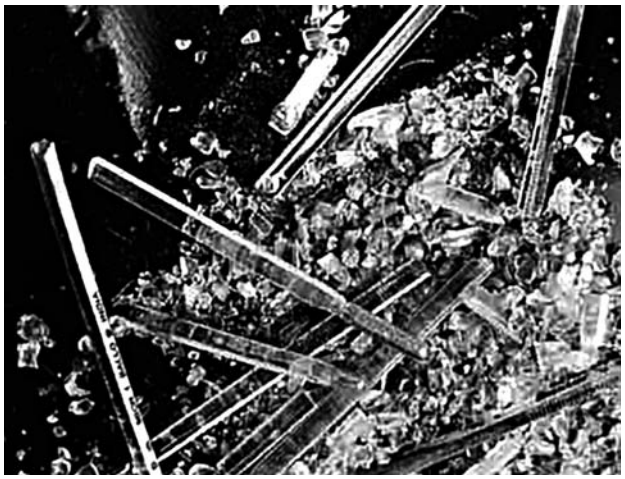


Photo: Sheweta Narayan

Broken thermometers outside the factory in Kodaikanal India. Former workers report serious mercury-related health problems.

PART TWO
OVERCOMING THE OBSTACLES
ACCURACY, AFFORDABILITY, DISPOSAL

It is clearly in the interest of public health and the environment to replace mercury-containing measuring devices in the health care sector. However, actually implementing such a transition runs into three fundamental challenges.

First, the long term use of healthcare mercury devices has helped to support a belief that mercury products are accurate and do not need calibration. Together with this belief, there is a deep skepticism in much of the medical community regarding the accuracy of alternatives.

Second, replacing mercury-based medical devices is often seen as an expensive proposition that is unobtainable for cash-strapped health care sectors in the developing world.

Third, is the thorny question of what to do with mercury that is taken out of circulation in the health care setting. Many governments lack the infrastructure to manage mercury waste, so it is often not clear what to do with this toxic element once a hospital takes it out of circulation.

Below are some answers to these questions, and some pathways for overcoming these obstacles.

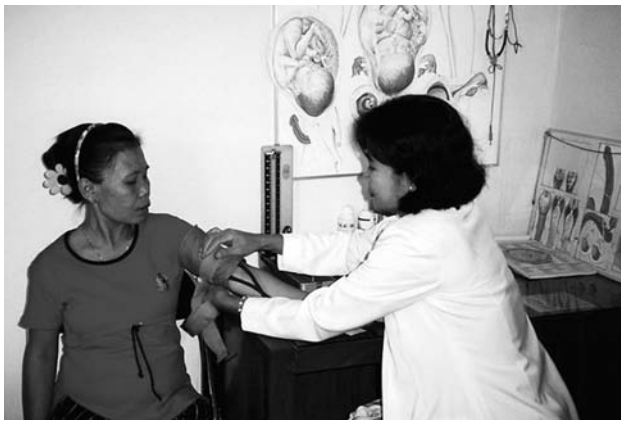
Accuracy

Some medical professionals still consider mercury to be the "gold standard," for measuring temperature and blood pressure. Yet, as peer reviewed studies from the last decade demonstrate, this is not, and probably never was true.

The mercury filled glass thermometer, though easily and frequently broken, is one of the simplest and most widely used diagnostic tools. It was therefore the first clinical mercury device to be evaluated for accuracy in comparison with a growing number of available alternatives.

After considerable debate in the 1990s, Leick-Rude and Bloom, during routine accuracy testing in a study, reported that 25% of the glass/mercury thermometers tested differed from the reference thermometer by >0.2 degrees Centigrade. This finding was consistent with the authors' review of prior work. Indeed, another recent study had rejected 28% of glass/mercury thermometers due to inaccuracy.[30]

Digital thermometers, the most commonly used mercury-free temperature device, use a thermistor to convert temperature into a known electrical resistance, and are highly sensitive. As with most products (mercury or mercury-free) their accuracy is dependent on manufacturing quality and techniques. Standards organizations such as the ASTM International have developed protocols that will help the healthcare community identify accurate alternatives.[31] It is imperative that the healthcare community and governments ensure that thermometers are purchased from manufacturers that follow techniques and testing protocols that are independently certified by ASTM or other internationally established regimes, so as to provide a product that provides the accuracy required.



Mercury sphygmomanometers are considered the "gold standard" by many physicians.

Yet many peer reviewed studies conclude that mercury-free measuring devices produce the same degree of accuracy.

Blood pressure measuring devices (sphygmomanometers) represent the largest reservoir of mercury in current medical use. Some doctors and nurses still believe that mercury is the "gold standard" for measurement, next to which the accuracy of alternative blood-pressure devices should be assessed.[32]

As with thermometers, mercury and non-mercury blood pressure devices provide accurate measurement so long as both instruments are calibrated. Examples of both inaccurate mercury and mercury-free sphygmomanometers can be found in the medical literature, though this inaccuracy is typically related to poor maintenance and calibration.[33] A large number of scientific studies have concluded that mercury-free measuring devices produce the same degree of accuracy as mercury devices, provided they are properly maintained and calibrated. For instance, a study at the Mayo Medical Centre concluded that aneroid sphygmomanometers provide accurate pressure measurements when a proper maintenance protocol is followed.[34]

A U.S. study from 2003 concluded in summary that "research on sphygmomanometers suggests that there are numerous good alternatives to mercury sphygmomanometers. Aneroid sphygmomanometers are cost competitive, have a long history in the field, and have been found acceptable by many hospitals." [35]

In a UK study, an aneroid device achieved an A grade for both systolic and diastolic pressures and fulfilled the requirements of the Association for the Advancement of Medical Instrumentation. The conclusion was that the aneroid device could be recommended for use in an adult population.[36]

The UK Medicines and Healthcare Products Regulatory Agency (MHRA) states that aneroid and mercury sphygmomanometers both need to be checked regularly in order to avoid errors in blood pressure measurement; the British Hypertension Society recommends testing every 6 to 12 months.[37]

Frequently lost in the discussion over device accuracy, and equally important is the issue of measurement technique. A 2002 Working Meeting on blood pressure measurement in the United States highlighted numerous studies which found that basic measurement technique, inappropriate cuff size and poor cuff size were providing signfificant errors in measurement.[38]

Switching to mercury free sphygmomanometers in clinical settings has not caused problems in clinical diagnosis and monitoring in Sweden or Brazil. The Swedish government, in fact, has completely eliminated mercury column sphygmomanometers.[39]

One problem that several hospitals in developing countries have encountered is that many aneroid and digital devices are of poor quality. Often these inexpensive, low-quality devices come from China. And as SEPA, China's environmental protection agency, admits, "currently, there are not many types of domestically developed mercury-free thermometers and sphygmomanometers, and the domestic products lags behind similar foreign substitute products in product quality."[40]

Yet many devices produced in China and elsewhere satisfy the criteria of professional organizations such as the British Hypertension Society, the European Hypertension Society and the Association for the Advancement of Medical Instrumentation. The British Hypertension Society (BHS) has created a list of vendors of sphygmomanometers that have met the BHS criteria and are suitable for clinical practice.[41]

As health care sectors in developing countries begin their substitutions, many are finding the non-mercury alternatives to be viable. As Louis Havinga, Manager of Health Technology Services for the Kwa Zulu Natal Province Department of Health in South Africa observes, before they decided to phase out mercury-based medical devices in the province, "clinical trials and technical trials were conducted and various electronic sphygmomanometers were found to be consistent and within acceptable accuracy range for clinical use."[42]

Affordability

Many healthcare practitioners are concerned about the availability of alternatives. In fact, there are many mercury-free thermometers and sphygmomanometers available from major medical equipment suppliers who service the global market.[43]

Yet the issue of affordability is still a challenging one, especially where the costs of human and environmental impacts of mercury releases are not accounted for. However, from a strictly ethical perspective, these costs must be taken into account. The literature cites a variety of examples of patients who have been killed and/or hospitalized for months as a result of exposure to one broken thermometer.[44]

In countries such as the United States, where mercury toxicity is well recognized, clean up costs are helping to drive the economics for alternatives. For example, at the Mayo Clinic, between 1993 and 1995, costs associated with 50 sphygmomanometer spills and leaks were estimated to be $26,000, not including time lost from temporary closure of clinical areas.

In a study done by Kaiser Permanente, the largest not-for-profit Health Maintenance Organization (HMO) in the United States, it was determined that when associated lifecycle costs are included (compliance, liability, training, etc.) the total cost per unit of an aneroid sphygmomanometer is about 1/3 that of a mercury-containing device. Mercury-containing devices are no longer being purchased by Kaiser Permanente.[45]

Mercury-based medical devices are, in the short run, still significantly less expensive than their digital or aneroid counterparts. This is due, in no small part, to the abundant supply of inexpensive mercury on the world market, and the massive production of inexpensive mercury-based devices in places like China and India. But as efforts in developing countries to substitute mercury-containing medical devices increase, the alternatives market is continuing to grow. In turn, as demand for the alternative increases, production around the world will increase to meet that demand, and the price for quality alternatives will inevitably drop.

However, in the absence of strict environmental health regulations, and with limited healthcare budgets, many hospitals today still face the challenge of deciding between a mercury device or its alternative. Those facilities with limited budgets have been able to successfully avoid this road block through operational strategies. For example, in hospitals with frequent mercury thermometer breakages, one strategy has been to account for the cumulative costs of thermometers over the course of a year and compare this with the cost of a digital or mercury-free alternative. Frequently, the additive cost is comparable to the replacement cost of one alternative. As the alternatives are typically more durable, the life time cost of the alternative is frequently comparable to or less than that of the mercury-containing item. In addition, these hospitals have assigned the alternative to a specific nurse or nurse team. As the employee assumes responsibility, the thermometer receives better care and is less apt to "accidental loss".

In the absence of strict regulation and with limited budgets, many hospitals face the challenge of deciding between a mercury device or its alternative.

The Neonatal Unit of Rivadavia Hospital, a public hospital located in Buenos Aires, Argentina pursued just such a strategy. The Unit purchased 21 digital thermometers, which they used to replace 240 mercury thermometers which would have been used between November 2005 and June 2006. In addition to preventing 360 grams a year of mercury spillage, the team of pediatricians reported cost savings as a result of substituting all of their mercury thermometers. The total savings for this small unit amounted to U.S. $158, and helped doctors convince management to implement a program to replace thermometers throughout the 350 bed hospital.[46]

Similarly, the Hospital Posadas in Buenos Aires, Argentina reported significant savings when it replaced all of its thermometers. Table 3 shows that between April and June 2006, this 450 bed hospital purchased 3,152 mercury thermometers. A year later, during the same period in 2007, it purchased 355 mercury thermometers and 188 digital devices. The cost savings totaled nearly U.S. $3,000.

At the Federico Gómez Children's Hospital in Mexico, HCWH partner CAATA estimates that this 250 bed institution will save a minimum of U.S. $10,000 over six years by replacing mercury thermometers. This estimate includes the costs of digital device and battery replacement, as well as mercury and battery disposal.[47]

One of the leaders in the effort at Posadas, Dr. María Inés Lutz concludes that savings come not only from the fact that digital thermometers last as long as about 10 mercury thermometers. Rather, doctors, nurses and other health care workers must be educated and involved in the process of phase-out. "The savings produced by switching from mercury to digital devices is derived both from a more durable product, and also from the raised consciousness among staff that taking good care of the equipment means that their own health is safeguarded as well."

Dr. Lutz also explains that the success with thermometers has opened the door to other mercury phase-out activities. "The possibility is now emerging that from the results of this first step, we can now steadily promote the replacement of other devices such as sphygmomanometers and other equipment that contains mercury."[48]

While there is a capital cost related to phasing out mercury-containing blood pressure devices, evidence is emerging that this kind of switch can also be cost effective.

In the Hospital Sao Luiz in Sao Paulo, Brazil, a 116 bed hospital, health care officials found that the costs of maintenance and calibration of digital and aneroid thermometers and sphygmomanometers were significantly lower than the costs of maintaining existing mercury devices. In fact, they determined if they were to replace all sphygmomanometers, wall thermometers and clinical thermometers in the hospital with alternative devices, that the savings on maintenance and calibration would pay back the initial capital investment of more than U.S. $9,000 in five years, while saving another U.S. $2,000 a year thereafter (see Table 4).[49]

However, in some parts of the world, the economic calculus is not yet as positive. For instance, in India, as Prashant Pastore, who works with Toxics Link, HCWH's partner organization in Delhi, explains when it comes to public hospitals or those run by not-for-profit institutions, "the unregulated trade of mercury coupled with cheap industry has played a major role in keeping low the price of mercury thermometers," therefore making the transition to mercury-free health care difficult.[50]

Mercury thermometers, most of which are produced domestically, cost around US$ 0.62 in India –or half of what they cost in many other places in the world. Meanwhile, decent quality digital thermometers, most of which are imported, cost US$ 5.35, or 33 percent more than in much of the rest of the world. The situations in China and the Philippines are similar. Thus, as Table 5 shows, while digital thermometers are four times more expensive than mercury devices in Argentina, in India and the Philippines they are more than eight times more costly, and in China more than 11 times more expensive. The economics of the switch-over becomes much more challenging as the ratio grows, thus requiring stronger political will to make the change.

Photo: Jamie Harvie

"Aneroid sphygmomanometers are cost competitive, have a long history in the field, and have been found acceptable by many hospitals." University of Massachussets, Lowell, U.S.

TABLE 3

Costs of Mercury vs. Digital Thermometers. The experience of Posadas Hospital, Buenos Aires Argentina:

April - June 2006 / Before Mercury Replacement

	Total Thermometers	Cost per Unt in $U.S. equivalent	Total Cost
Mercury Thermometers	3152	$1,33	$4,192
Digital Thermometers	0	$4,00	0
Total	3152		**$4,192**

April - June 2007 / As Digital Thermometers are Introduced

	Total Thermometers	Cost per Unt in $U.S. equivalent	Total Cost
Mercury Thermometers	335	$1,33	$445
Digital Thermometers	188	$4,00	$752
Total	523		**$1,197**

TOTAL SAVINGS FOR 3 MONTHS: U.S. $2,995 [51]

Hospitals and health care systems in Argentina, Brazil, Mexico, South Africa and elsewhere have found that when breakages, maintanence and calibration costs are taken into account, it is economically viable to switch to mercury-free thermometers and blood pressure devices. Investments pay-off over one to five years.

TABLE 4

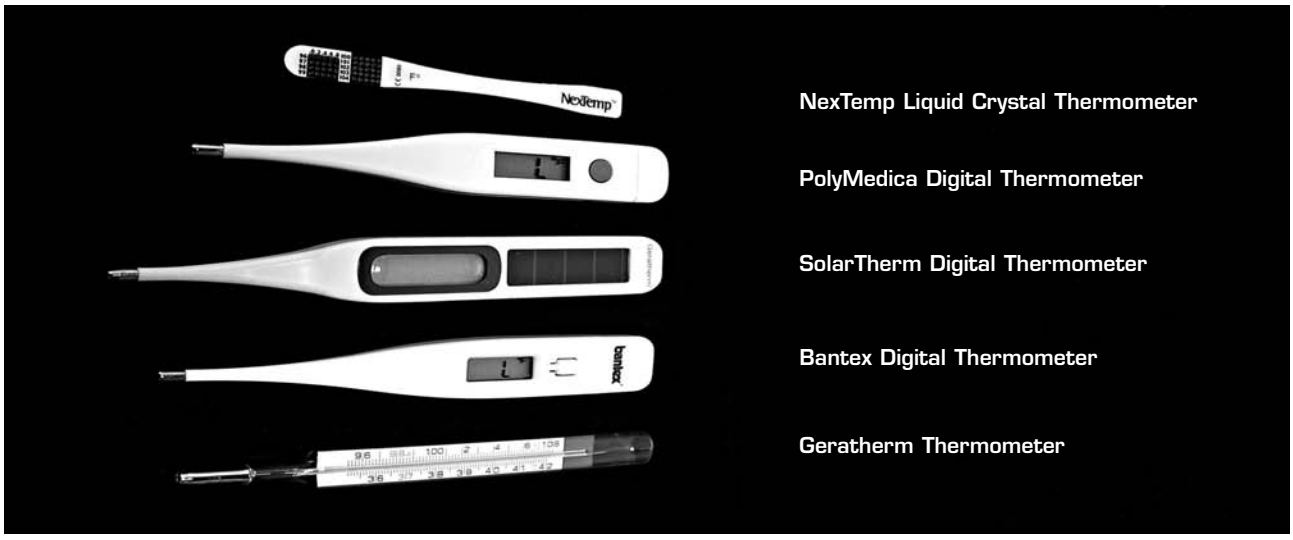
Estimated Costs of Replacing Mercury Equipment in Hospital São Luiz, São Paulo Brazil

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
Digital Devices					
Initial Investment	(9,412)				
Annual Maintenance	(2,630)	(3,892)	(3,892)	(3,892)	(3,892)
Total costs adjusted by 12% annually for inflation	**(12,040)**	**(17,381)**	**(23,360)**	**(30,054)**	**(37,560)**
Mercury Devices					
Annual Maintenance	(5,923)	(5,923)	(5,923)	(5,923)	(5,923)
Total costs adjusted by 12% annually for inflation	**(5,923)**	**(12,559)**	**(19,991)**	**(28,314)**	**(37,637)**
Net Difference	**(6,125)**	**(4,829)**	**(3,377)**	**(1,751)**	**69**
Annual Savings after Year 5					**$2,031**

Figures in U.S. $ converted from Brazilian Reais.

Photo: Jamie Harvie

Electronic thermometer: speed, accuracy, security, and convenience in a single device.



NexTemp Liquid Crystal Thermometer

PolyMedica Digital Thermometer

SolarTherm Digital Thermometer

Bantex Digital Thermometer

Geratherm Thermometer

Photo: Jamie Harvie

TABLE 5

A Comparison of Prices of Mercury and Digital Clinical Fever Thermometers in Selected Countries[52]

	Argentina	Brazil	Mexico	India	China	Philippines	South Africa	USA	England	Czech Rep
Mercury Thermometer	$1.33	$1.52	$1.24	$0.62	$0.41	$0.55	$0.80	Not available	$1.50	$1.00
Digital Thermometer	$4.00	$10.52	$3.77	$5.35	$4.65	$4.67	$4.37	$2.89	$7.00	$5.00
Price Ratio	3 : 1	6.9 : 1	3 : 1	8.6 : 1	11.3 : 1	8.5 : 1	5.5 : 1	0 : 1	4.6 : 1	5 : 1

Disposal

Hospitals can solve their greatest mercury waste and acute mercury exposure problems simply by replacing mercury thermometers with digital alternatives. If mercury is not used, spills will not occur.

However, the problem of what to do with other mercury waste remains. This includes "historical waste" (waste from spills that occur until replacements are made), waste from mercury devices that are taken out of use, the ongoing collection of dental amalgam waste, and waste from digital thermometer batteries that contain trace amounts of mercury and therefore require end of life management.

One option for disposal, though not ideal, occurs in North America and many European countries, where governments have developed infrastructure for the collection of mercury waste products. These wastes are "recycled" into new mercury-containing products. Ideally, these products involve essential uses of mercury for which alternatives do not currently exist. While this scenario provides healthcare facilities and others with a means of removing mercury waste from their facility's waste stream, the continued sale and use of mercury-containing products will invariably result in breakage and escape to the environment during product life or end of life.

The preferred scenario is one in which mercury and mercury-containing products are no longer used, and the mercury in use is collected and no longer returned to the marketplace in products.

Yet there is no one simple solution to the mercury problem, and until the goal of mercury elimination is realized, a variety of strategies must be implemented that move toward this solution. Some of these strategies are waiting to be invented. Some are listed below and are works in progress. Nevertheless, it is important to recognize that these strategies should be employed with the long-term goal in mind, while also providing practical short-term solutions.

Storing Mercury Waste On-site:
This short-term solution is designed to prevent mercury release to the environment. It provides an alternative to mercury disposal in solid waste, medical waste or waste water. It can be implemented in the absence of mercury recycling or collection infrastructure. Facilities can develop a well ventilated, designated location for the storage of waste mercury collection drums. These steel drums must have liners and be placed on a concrete slab. Drums must be protected from rainfall and be secured from theft and/or protected against unauthorized opening. Broken and/or obsolete mercury medical devices should be placed in these drums along with spilled mercury (following facility mercury spill clean-up procedures). The storage site should be secure and carefully monitored. Facilities should develop a waste mercury collection plan that includes procedures and outlines individuals' responsibilities.

Extended Product Responsibility (EPR):
EPR is a suite of policy tools for reducing the generation of wastes by promoting greater recycling and resource recovery and encouraging more sustainable product design. EPR schemes shift the responsibility for nominated product wastes to the producers or suppliers of those products according to the *Polluter Pays Principle*. EPR schemes can include: advanced disposal fees; product take-back policies; information and labeling schemes; deposit/refund schemes.

National Regulations:
Some national governments are now developing processes and timelines for the long term retirement of mercury wastes.

For instance, Sweden is a global leader in this regard. In August 2005, the country passed a regulation which required that wastes be placed in terminal storage in bedrock by at January 2015.

Meanwhile, in the United States, in the spring of 2007, the U.S. EPA announced the formation of a stakeholder panel and planned public meetings to consider how mercury stock should be managed. Considerable work on this issue remains to be accomplished to ensure that any solution is safe, but the process is beginning to move.

While these and other long-term storage options are being considered in industrialized nations, developing countries can also take a series of steps. National governments, via the Ministry of Health, Ministry of Environment, and through legislation can create the regulatory climate to phase out mercury, while also helping shape the market for alternatives. For instance governments can:

- Mandate Extended Producer Responsibility (EPR) with regard to mercury-containing medical products. Under such as system, manufacturers and/or importers would be charged money that would be used to pay for spills and clean-ups and make mercury less economically advantageous.

- Mandate and fund a mercury waste management and storage program whereby mercury waste is taken from hospitals, individual homes, industrial sites and elsewhere and stored in a secure location. Mercury thermometer exchanges –where individuals exchange their mercury thermometers for digital devices– could form part of such a program.

Global Guidelines:
Currently, the Secretariat of the Basel Convention on the Control of Movements of Transboundary Hazardous Wastes and their Disposal is developing a draft set of guidelines to standardize the management of mercury waste in several sectors, including health care.[53] These guidelines should prove helpful as health care institutions and other industries move toward mercury elimination.

DENTAL AMALGAM AND MERCURY WASTE

Many healthcare facilities also have dental facilities on site. The use of dental amalgam is a significant source of mercury discharge into the environment, including scrap amalgam and amalgam waste, which is discharged to the wastewater stream. Dental mercury should also be considered a source of air borne emissions from cremation of dental amalgam.

Globally, dental mercury use is in decline as a result of regulation and cultural preferences for "white" composite amalgam materials.

The magnitude of the direct human health impacts on dental workers and patients from dental mercury is currently a hotly debated topic. But when it comes to mercury release from dental offices, there is little doubt that meaningful pollution prevention practices can be implemented to minimize and eliminate this important source of pollution.

The magnitude of dental amalgam use and discharge is significant. As the chart on page 9 shows, dental amalgam makes up a major portion of worldwide mercury use. In Europe, the second largest use of mercury is dental amalgam. In 2000, the original 15 member states of the EU alone used 70 tons.[54] In the United States, the dental sector is now the third largest user of mercury. According to recent estimates, it used 44 metric tons of mercury in 2001.[55]

It is estimated when an amalgam is prepared for a filling, 10 percent is leftover and is often simply discarded either into the dental clinic's waste vacuum system or into a chairside cuspidor.[56]

A variety of pollution prevention opportunities exist. A simple procedure, and important from the perspective of occupational health, is the use of prepackaged dental amalgam capsules. These obviate the need for dentists or their staff to mix their own amalgam, reducing waste and helping reduce spills. Another involves simple inexpensive "traps". Most dental offices have chairs equipped with a coarse filter or "chair side trap". The purpose of this trap is to collect coarse mercury and other particulates to protect the vacuum system of the office plumbing system. These inexpensive traps can remove approximately 60% of the dental mercury discharge.[57] Another 35% or more can be removed with the addition of an amalgam separation device. These can range from somewhat complex technological solutions to simple settling tanks. Disposing of such mercury wastes in the long term requires a strong government waste management system.

Several countries, including Sweden, Norway, Finland, Austria and Canada have sought to varied degrees to limit or reduce the use of mercury amalgam[58/59].

EXPORT OF OBSOLETE DEVICES

As a result of the phase out of mercury-based medical devices in the United States and Europe, there is a growing collection of mercury-containing medical products, which, because of their potential for mercury release, are no longer used. As these products remain functional, medical donations of mercury-containing products have been proposed as a short-term management strategy. These donations fit a perceived need for those areas of the world where medical supplies are in short supply and may also eliminate associated end of life management costs for the donor.

This export of obsolete mercury-based medical devices from developed to developing countries takes what essentially should be a hazardous waste regulated under the Basel Convention, and transforms it into what can be portrayed as a philanthropic donation.

And while it may be argued that public health may be compromised without access to still functional medical products, fundamental ethical principles must also be considered. These include:

- that past and current producers, and/or donors of these products be held responsible for end of life management;
- the right of all healthcare workers to a safe healthy work environment;
- the right of all people to a healthy global environment;
- that principles of informed consent on the risks and costs of mercury exposure by healthcare workers, patients, and communities are enforced.

It is the position of Health Care Without Harm that without full disclosure to potential recipients of mercury medical product donations on the full human, environmental and economic cost of mercury exposure, and without full donor responsibility for end of life management, spill remediation and their related costs, mercury medical product donations are not ethical, should be discontinued and should be replaced by donations of safer materials that meet the highest standards of the donating country.

PART THREE
MEETING THE MERCURY-FREE CHALLENGE

Substitution of products and processes containing or using mercury with products and processes without mercury may be one of the most powerful preventive measures for influencing the entire flow of mercury through the economy and environment.
UNEP Global Mercury Assessment

There is a growing movement around the world to make health care mercury-free. The United States and Europe are both well along the path in this direction. A number of developing countries are creating models appropriate for their realities that could be replicated in one form or another, throughout Asia, Africa and Latin America.

This section provides a brief overview of the successes in the U.S. and Europe, and then delineates examples of specific hospitals that have made the switch in the Global South. It then goes on to highlight a number of policy models that are emerging in places ranging from Argentina to South Africa to the Philippines.

MERCURY-FREE HEALTH CARE IN THE UNITED STATES AND EUROPE

United States

Over the course of the last 10 years, with support from Health Care Without Harm, Hospitals for a Healthy Environment and environmental health advocates across the country, the U.S. health care sector has made significant progress in addressing mercury in health care. Noteworthy results include:

- All the top pharmacy chains in the nation have stopped selling mercury thermometers, representing approximately 31,844 retail stores, making it next to impossible to purchase a mercury thermometer in the United States.[60]

- At least 28 states have severely restricted or banned the sale of mercury fever thermometers.

- More than 1,200 hospitals have signed a pledge to eliminate the use of mercury through Hospitals for a Healthy Environment, and more than 400 have become virtually mercury-free.

- Most large Group Purchasing Organizations have taken mercury sphygmomanometers "off contract", including Consorta (buys for 480 hospitals), Premier, and Novation (buy for 3,100 hospitals).

Over 97 percent of 554 hospitals surveyed by the American Hospital Association are aware of and have taken steps to address the mercury issue. These steps include:

Mercury in clinical devices

- Over 80% have completely eliminated mercury thermometers from their facilities, and 18.7% have replaced some or most with a plan in place for eliminating the remainder.

- Over 73% have completely eliminated mercury sphygmomanometers, with 25% having replaced some or most with a plan in place for eliminating the remainder.

- About 75% have completely eliminated other clinical items (cantor tubes, bougies, etc) with about 10% having replaced some or most with a plan in place for eliminating the remainder.

Mercury in facilities

- Over 72% have inventoried all devices and labeled them as mercury-containing where appropriate.

- About 75% are recycling fluorescent bulbs.

Other environmental improvements made in the healthcare sector

- 80% report that they have a waste reduction policy.

- 90% have a regulated medical waste minimization program.[61]

European Union

In July 2007, after considerable pressure from Health Care Without Harm, the European Environmental Bureau, the Zero Mercury Working Group and several other NGOs in Europe, the EU banned the sale of mercury thermometers for use in health care. The ban will go into effect in 2008.[62]

Under this recently passed Europe-wide legislation, mercury sphygmomanometers and other measuring devices are also banned for sale to the general public. EU authorities will now conduct market research in all EU member states to determine the level of availability of mercury-free sphygmomanometers that are viable for healthcare settings to possibly incorporate them into the ban.

This move is part of a comprehensive mercury strategy adopted in January 2005 by the European Commission with the aim of protecting public health and the environment. Measures in the strategy include a:

- **Ban** on the marketing and sale of all measuring devices containing mercury for domestic use.

- **Ban** on the sale of mercury thermometers for use in healthcare settings.

- **Commitment** to ban the export of mercury from EU countries by 2011 at the latest.

- **Commitment** to consider regulatory measures to reduce mercury use in dental amalgam and ensure proper disposal of dental amalgam waste.

- **Improved protection** of the European population from mercury exposure through bio-monitoring of vulnerable groups such as children and pregnant women.

- **Support** for international action on mercury through institution of a global agreement controlling mercury use and trade.[63]

The European Union has also already banned mercury in a number of products including batteries and electronic and electrical equipment. The EU further encourages member states to advise citizens about the risks to pregnant women and children of mercury exposure from frequent consumption of predatory fish.

Moreover, evidence from accuracy studies, serious concerns about the hazards of mercury, and ready availability of alternatives has led to several EU countries and a number of health care facilities and associations to completely prohibit mercury in most of their applications. For instance, Sweden, Netherlands and Denmark have all banned the use of mercury thermometers, blood pressure devices, and a variety of other equipment.[64]

SHIFTING DEMAND IN THE GLOBAL SOUTH

With growing awareness of the hazards of mercury in health care, and its contribution to global environmental problems, the health care sector in many Asian, African and Latin American countries is beginning to educate itself on the issues.

As it becomes clear to health care leaders in developing countries that accurate, cost-effective alternatives are available, more and more hospitals, health care systems, and entire nations are beginning to make the switch. The WHO policy on mercury in health care (see p. 8) has provided a framework for this transition.

Health Care Without Harm has been in the forefront of this movement for mercury-free health care. In association with UNEP, we have organized several awareness raising workshops in South East Asia, Latin America and Africa, which have educated health care leaders and prompted them into action.

These actions have consisted of hundreds of individual hospitals making the switch to mercury-free health care, as well as a series of policy initiatives at the local, municipal, state/provincial and national levels that can serve as models for replication in other parts of the world.

What follows below is a series of six stories of hospitals from throughout the developing world that have switched or are in the process of switching to mercury-free health care, as well as three sets of policy solutions that are emerging.

SIX STORIES OF HOSPITALS MAKING A DIFFERENCE

1 / ARGENTINA - Nurses and Doctors in the Forefront

At the 350 bed Rivadavia public hospital in Buenos Aires, Argentina, pediatricians Luis Somaruga and Mercedes Zarlenga began surveying the staff of the pediatric ward and neonatal unit of which they are in charge. They sought to best understand how to switch from mercury to digital thermometers. What they discovered shocked them. Their inquiry to the nurses on their ward revealed that several no longer used mercury thermometers. Rather, having learned about the occupational hazards of mercury, as well as the danger it posed to the infants in their care, they took money out of their own pockets and purchased digital thermometers.

The high level of consciousness of the nursing staff, and the strong commitment by Drs. Somaruga and Zarlenga to go mercury-free resulted not only in the Rivadavia pediatric ward and neonatal unit becoming the first in Argentina to go mercury-free, but also a commitment from the entire hospital to switch. At the time of this writing, all mercury-containing laboratory chemicals, 70 percent of mercury thermometers, and 30 percent of sphygmomanometers had been replaced, with the remainder on order.

What it took, says Dr. Somaruga, was "a group of people convinced of the need to change and their commitment to make it happen. This group educated the hospital community by producing fact-sheets and posters, and by organizing workshops" while also engaging with hospital management.[65]

Educational poster used throughout Argentina, where 57 hospitals are on their way to becoming mercury-free.

More than 28 hospitals in Argentina have followed Rivadavia's example and have completely switched to mercury-free thermometers. Overall, 57 hospitals and several clinics have committed to change over to mercury-free thermometers and blood pressure devices or are in the process of doing so. The number continues to grow.[66]

A growing number of hospitals throughout the developing world are piloting mercury-free projects.

These institutions are becoming models for the health care sector in their countries.

Educational poster used in São Paulo, Brazil, where more than 90 hospitals are going mercury-free.

2 / BRAZIL - Leadership From Inside the Government

Cecilia Zavariz works for the Brazilian Ministry of Labor in the mega-city of Sao Paulo. For more than twenty years, she has struggled tirelessly to educate her colleagues and the general public about the hazards of mercury.

One of her major areas of concern is the massive health care sector in São Paulo, where, until recently, there was little awareness of the dangers this toxic element posed. For quite some time, there was very little positive response from hospitals and the Ministry of Health officials. However, in the last couple of years, things have begun to change as more and more people in the health care sector recognize the importance of this issue.

Since 2006, Zavariz and a growing number of allies have succeeded in convincing more than 92 hospitals to sign agreements committing to eliminate mercury-based thermometers and sphygmomanometers from their operations. Of these hospitals, more than 42 have already done so.[67]

One such hospital is Irmandade Santa Casa de Misericórdia, which entered into an agreement with Zavariz's office in November 2006 to replace devices containing mercury throughout the institution. Irmandade hospital, considered to be the largest private philanthropic hospital center in the world, is actually a complex of six hospitals with a 2,000 inpatient bed capacity. One of the hospitals in the complex alone, Hospital Central, serves an average of 5,000 people every day, from several regions of Brazil, as well as from other countries. Another hospital, São Luiz Gonzaga, serves an average of 1,500 patients and delivers 300 babies every day. The complex is a nationally renowned teaching institution, with a medical and nursing school. It provides all medical specialties for patients and carries out complex procedures, including transplants, heart surgery and neurosurgery, among many others. It also has its own laboratories, with image diagnosis service.

In September 2007, Zavariz and her team from the Ministry of Labor inspected two of the hospitals in the complex and confirmed that in the Hospital Central and the 340 bed Guarulhos General Hospital "all devices with mercury, such as clinical thermometers… and sphygmomanometers, have been abolished and replaced for devices without mercury."

"The removal of mercury from an institution such as Irmandade da Santa Casa de Misericórdia of São Paulo" writes Zavariz, "is of fundamental importance for being a reference for the whole country in the area of health and education, for the magnitude of its offered services, the number of people and health professionals being assisted in its facilities."[68]

Photo: Jamie Harvie

Tiantan hospital in China is investing its own financial resources to substitute mercury-based medical devices.

Most hospitals that address the issue systematically are finding it economically viable to protect public health and the environment by switching to alternatives.

3 / CHINA - First Steps

In the Fall of 2006, the China's environmental agency SEPA and the U.S. EPA began a pilot project with two Beijing Healthcare facilities, the 1000 bed Tiantan Hospital known for neurological research and specialty, and the 1050 bed Jishuitan Hospital specializing in burn treatment, bone, and major reconnective surgeries. The U.S. EPA invited HCWH U.S. partner Institute for a Sustainable Future as technical expert to assist with this effort.

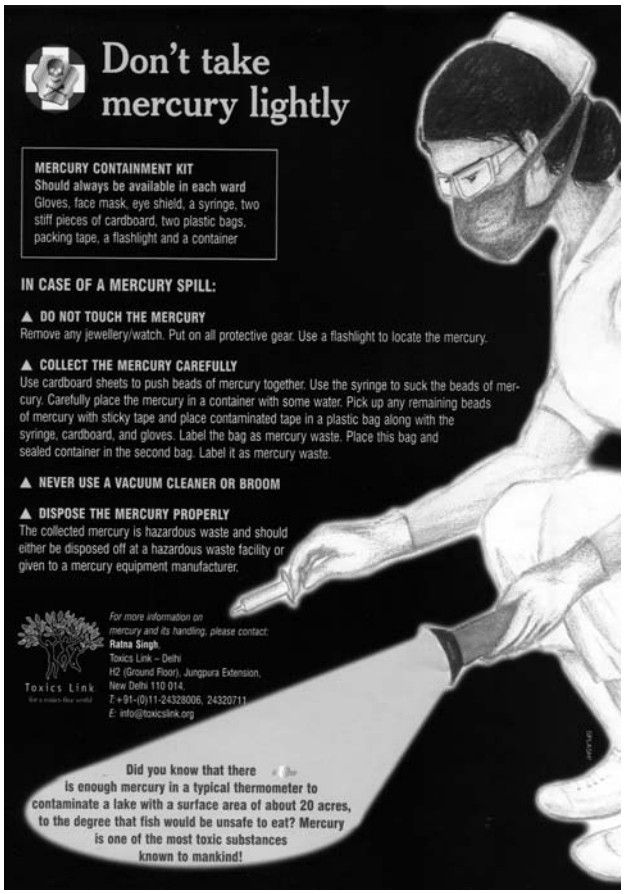
The hospital administration and agency staff were excited and interested to pilot this project. Presentations were made to healthcare staff on the environmental health impacts associated with mercury, and a hospital inventory was taken. As with most healthcare facilities beginning mercury reduction efforts, the majority of mercury used was in blood pressure devices and thermometers.

Hospital assessments at the beginning of the project showed that Jishuitan Hospital lost 4,500 thermometers every year. Hospital representatives estimated that approximately 67% of this loss was a result of breakage. By the end of the project, this number had been reduced to 4000 per year. Similarly, Tiantan Hospital was replacing approximately 8,000 thermometers a year or 6 per bed per year. By the end of the pilot this number had been reduced to 6,000.

Several economic and legal hurdles must be addressed before a substitution program can begin in earnest. These include finding clinically acceptable substitutes that are also economically viable in the Chinese context, and working with local and national government entities to develop a mercury waste management system.

Yet this one year project was an important beginning to mercury reduction efforts in China's health care sector, and has already demonstrated progress. Project partners performed staff-wide training and education. The team conducted pre- and post-training surveys to assess participants' new awareness. Educational posters were developed and posted in the hospitals. Maintenance areas were remodeled to better control potential spills and protect worker health and safety. Thermometer breakages and loss decreased significantly, as did the quantity of spills from mercury-containing blood pressure devices.

At the one year project completion point, the directors of the hospitals shared their experience at a workshop for other Beijing hospitals and the broader healthcare community. Meanwhile, Tiantan Hospital committed to spend more than U.S. $65,000 of its own resources to substitute mercury-based medical devices.



Educational poster for hospitals in India.

4 / INDIA - NGO and Hospital Cooperation

In many cases, health care institutions are inspired to make the change by non-governmental organizations working for environmental health. Such is the case in India, where HCWH partner, Toxics Link, a well-established NGO, has worked hand-in-glove with a number of hospitals.

As in many other parts of the developing world, several of private hospitals in India have already made the switch to mercury-free health care. From an economic perspective, it is relatively easy for these institutions to move to alternatives, as they are able to pass the cost along to the patient.

However, institutions without such financing in a nation like India, where the cost of a digital thermometer is still eight times that of a mercury-based device, find making the transition more difficult. In a country which only spends the equivalent of $82 per person on health care every year, going mercury-free is a steep challenge.

This economic hurdle is compounded by ongoing skepticism on the part of many doctors with regard to the accuracy of alternative devices.

Yet even in this environment, model hospitals are emerging. One is St. Stephens Hospital in New Delhi, which has replaced all its mercury thermometers. They have worked over the past several years in collaboration with the Delhi-based Toxics Link.

Toxics Link has worked closely with St. Stephens hospital personnel to educate them regarding the hazards of mercury and the viability of the alternatives. As a result, St. Stephens made the switch. Says Prashant Pastore of Toxics Link: "what works here right now is more and more awareness in hospitals and communities on environmental hazards of mercury."

Toxics Link's partnership with St. Stephens and several other hospitals in the Delhi area has begun to pay off. Recently several health care leaders came together to form the Mercury-Free Health Care Committee of India. The committee has begun to develop a strategy for "helping the Indian health care industry to go mercury-free."

Pastore suggests that in order for this to happen, the economics of mercury and alternative devices need to shift in India. In the long haul, he says, a strong domestic industry that produces affordable alternative devices must to emerge and help drive the transition.[69]

5 / MEXICO - Pediatrics Hospitals Demonstrate Leadership

In Mexico City, two children's hospitals are moving to set an example for the rest of the country. The National Pediatrics Institute and the Hospital Infantil de Mexico, "Federico Gomez," have both committed to eliminating mercury from their operations. The National Pediatrics Institute is a tertiary level teaching, research, and medical care institution with 230 beds, and has pediatric specialists in multiple medical disciplines and is one of the National Health Institutes of Mexico. The "Federico Gomez" hospital--also a children's hospital, is one of the National Health Institutes of Mexico, and is a medical service, teaching, and research hospital affiliated with the National Au-

Dr José Ignacio Santos, Director of the Federico Gomez Children's Hospital in Mexico City signs a pledge to eliminate mercury in his institution.

tonomous University of Mexico. This hospital has trained more than 5,600 pediatricians and 1,300 nurses from Mexico and other countries, and has treated more than eight million children, with an average of 153,111 patients per year. The hospital has a total of 250 beds. The hospital also has a program dating more than 16 years, known as the Mexican Center for Health Education by Television (*Centro Mexicano de Educación para la Salud por Televisión*-CEMESATEL), with 538 reception centers in more than 19 countries.

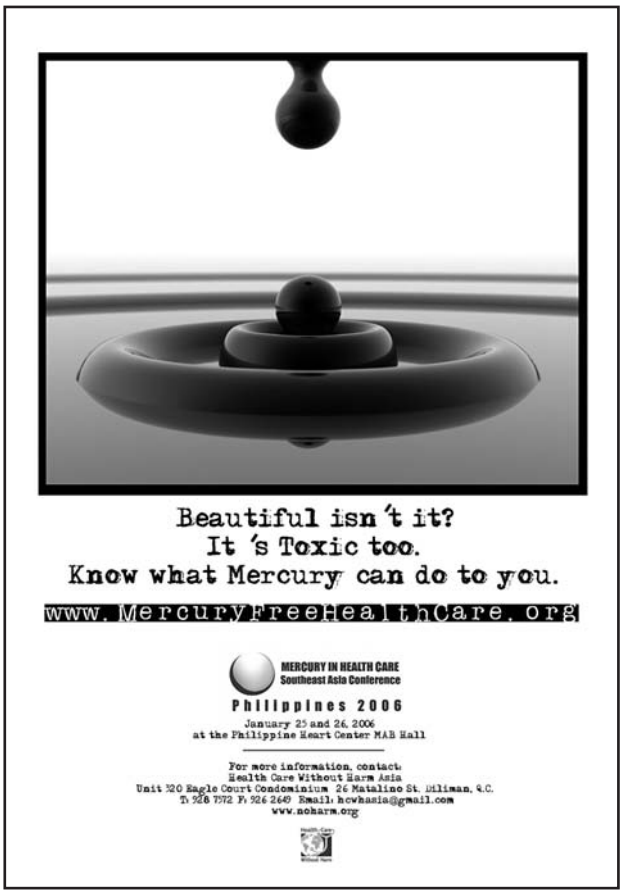
With support from the North American Commission for Environmental Cooperation, as well as from both the environmental and health secretariats (SEMARNAT and COFEPRIS) of the Mexican government, Health Care Without Harm and our Mexican partner CAATA are working with both of these hospitals to implement mercury elimination plans. The efforts of both of these hospitals are significant not only in and of themselves, but also because each of them is a teaching institution with significant national clout in terms of training and information dissemination. Thus, if successful, mercury replacement at these hospitals can be replicated more broadly in Mexico and beyond.

6 / THE PHILIPPINES
A Rapid Transition

The 283 bed Philippine Heart Center is the leading institution in the country committed to caring for patients with cardiovascular diseases. The center offers a comprehensive program of patient care, education and training, research and public information. Now on its 32nd year, the Philippine Heart Center has gone mercury-free, adding another significant milestone to its history. Once it made the decision to switch over, the Heart Center wasted little time. In January 2006, when the Center, together with Health Care Without Harm and others, hosted the First Southeast Asian Conference on Mercury Free Health Care, it still exclusively used mercury-based medical devices. During that year alone, the Heart Center distributed 13,000 mercury thermometers to all incoming patients as part of their admission kits.

Photo: Joshua Karliner/HCWH

The first South East Asia Conference on Mercury in Health Care was held at the Philippine Heart Center. This 283 bed hospital subsequently went mercury-free.



Educational poster from the Philippines

By the end of the year, the Heart Center decided to take action. In February 2007, the Center had established mercury spill clean-up procedures and had made mercury spill kits available in every nursing unit in the hospital. By March, it had formulated an evaluation process for measuring devices. In June, based on its evaluations, the Center began purchasing digital thermometers and sphygmomanometers. In July, it began substituting the mercury devices. By September 2007, the Philippine Heart Center had achieved full phase-out of all mercury-containing measuring devices.

The Heart Center is partially financing its transition by passing the cost on to patients. There has been only minor resistance from patients who now must pay U.S.$ 4.67 for a thermometer, instead of the previous arrangement in which they paid U.S.$ 0.55 for a mercury device as part of the hospital's admissions kit.

Nurses in the Heart Center provided valuable support for the phase-out after realizing the dangers of cleaning-up mercury spills. Health Care Without Harm South East Asia was also involved throughout the process of the phase-out, providing information and training resources. The Heart Center is one of the first hospitals in the Philippines to completely make the switch out of more than fifty who have committed to and/or are in the process of doing so.[70]

THREE SETS OF POLICY SOLUTIONS

1. Large Cities

In many countries, large cities run entire health care systems. As such, these cities (some of which, like Buenos Aires, Argentina, are administratively equivalent to provinces or states), can become prime actors for change. Below are examples of two of the world's twenty most populous cities that are either implementing or developing policies for mercury-free health care.

National governments, large cities and provinces in Asia, Africa and Latin America are forging model policy initiatives to replace mercury-based medical devices with safer alternatives.

Photo: Neonatal Unit, Rivadavia Hospital, Buenos Aires, Joshua Karliner/HCWH

Buenos Aires, Argentina: In July 2006, the Ministry of Health for the Buenos Aires city government, which runs the largest health care system in Argentina, announced that it would gradually phase out mercury-based medical devices.[71]

Implementing such a policy however, is no small task given that the system is composed of 33 major hospitals and 38 smaller health care centers. These hospitals have more than 8,000 beds and also receive more than nine million out-patient visits annually. When the government did an inventory of mercury-based medical devices, it found that it purchases 40,000 thermometers a year. Economic studies conducted by city officials found that these thermometers could be replaced with digital devices at little to no extra cost. It also identified 963 mercury column sphygmomanometers.[72]

The potential of moving such a large system to mercury-free health care is that it could help make the switch more economically and politically viable in the rest of the country, and perhaps the region. If successful, it could be replicated by large cities throughout Latin America as well as other regions of the world.

In order to support the development of such a model, UNEP, together with the U.S. Environmental Protection Agency, have provided financing for Health Care Without Harm under the UNEP Mercury Partnership Program, to work with the Buenos Aires City government to provide training, educational materials and equipment to implement the phase-out. As of this writing, HCWH and the Buenos Aires City Ministry of Health were working closely with twelve hospitals which were well on their way to total mercury phase-out.

Delhi, India: With more than 14 million inhabitants, Delhi is the second largest urban area in India, next to Mumbai. In June 2007, the Delhi government's health department decided to create a short and long-term policy framework to address mercury in health care. The government formed a committee headed by the dean of the Maulana Azad Medical College to generate a plan to phase out mercury-based medical devices and properly dispose of them. This committee has recommended to the Delhi government that it educate hospital staff on the hazards of mercury, and remove it from the health care setting in "a phased manner.[73]

2. Provincial/State Policy

State or provincial governments are also playing a leadership role.

Kwa Zulu Natal, South Africa: In January 2003, the Health Technology Unit of the Kwa Zulu-Natal Provincial Department of Health issued a directive banning the purchase of mercury column sphygmomanometers and stipulating that all new sphygmomanometers must be of the aneroid variety. In March 2006, the Department issued another directive to phase out mercury thermometers. This order offered hospitals the opportunity to exchange their mercury thermometers for digital devices over a three month period.[74]

By directing its hospitals to go mercury-free in early 2003 and 2006, Kwa Zulu-Natal became the first province in the developing world to make the switch. These progressive moves followed a dedicated effort by HCWH partner groundWork and other civil society NGOs in the province. The Provincial Department of Health also made the decision after studying the cost effectiveness of making the switch and determining the accuracy and availability of the alternative products.

Chaco, Argentina: In August 2007, the Provincial Government of Chaco, in northern Argentina, committed to making all of the 8 hospitals and 296 clinics and health centers under its jurisdiction mercury-free. In a joint declaration with Health Care Without Harm Latin America, the one-million person Province's Ministry of Public Health committed to conducting an inventory of all mercury-containing medical devices, educating health care personnel, identifying the equipment that can be replaced, discontinuing the purchase of mercury equipment and creating a mercury-free purchasing policy.[75]

3. National Policy

In many countries, the national government is well positioned to mandate a national transition to mercury-free health care via its ministry of health. Many governments set national purchasing and technology standards, and/or purchase in bulk for public health systems.

The Philippines: In 2006, at the opening of the First South East Asian Conference for the elimination of Mercury in Health Care, the Secretary of Health, Francisco Duque surprised the more than 200 hospital leaders and health care advocates in attendance with a pronouncement. He declared that the Philippine government would issue an administrative order phasing out mercury from the health care sector. In 2007 the Department of Health drafted the order which calls for the replacement of mercury where viable alternatives exist.

In addition to mandating the phase-out of thermometers and blood pressure devices, along with the safe disposal of the mercury waste by the government, the draft administrative order also recommends the phase-out of all non-essential uses of mercury in laboratory chemicals; the collection of dental amalgam mercury waste in traps and filters; use of non-mercury-containing batteries where possible; and the proper disposal of batteries; substitution, where possible, of mercury-containing vaccines; use of low-mercury fluorescent lamps and the recycling of all fluorescent lamps.[76] As of this writing, the order was awaiting approval inside the Department of Health.

Photo: Joshua Karliner/HCWH

Philippines Secretary of Health, Francisco Duque, announcing in 2006 that his department would develop an administrative order to phase-out mercury in health care.

Cuba: Since the 1980s, the Cuban government has implemented a national policy of replacing its mercury sphygmomanometers with aneroid devices purchased from China. According to Dr. Raquel Junco Diaz, a researcher with National Institute of Hygiene, Epidemiology and Microbiology, it has done so because the U.S. government's policy of isolating the country gave it few reliable options to purchase from other sources. Junco also notes that aneroid devices were less expensive than their mercury column counterparts.

Since 1984, Junco writes, Cuba began the practice of giving every doctor who graduated from medical school an aneroid sphygmomanometer. Today, every third year medical student receives a stethoscope and an aneroid sphygmomanometer from the state. Every family medical clinic in the country is also equipped with an aneroid device.

The country still purchases mercury devices for use in emergency rooms and other purposes, but the number of aneroids far outweighs them. Today, the centralized purchasing program of the Cuban government procures aneroid sphygmomanometers for the entire country. In 2006, it purchased 70,000 devices for adults and 2,700 for pediatric uses. The plans for 2007 stipulated 100,000 adult and 3,500 pediatric devices. By contrast, the 2007 plan called for the purchase of 1020 mercury column sphygmomanometers.

Thermometers, however are another story. To date, there has been no move to substitute mercury thermometers in Cuba. Thus the country imports 1.2 million mercury thermometers annually –the equivalent of roughly 1.2 metric tons of mercury. Ninety percent of these thermometers are destined for the general population, and 10% are used directly by the health care sector.

Junco notes that there is growing consciousness of the environmental health impacts of several chemicals, including mercury. Cuba's new environmental strategy for the health care sector, which is in development, calls for the elimination of the use of such hazardous materials.[77]

MERCURY IN VACCINES

Health Care Without Harm Position on Thimerosal in Vaccines

Vaccination programs provide important public health benefits. Health Care Without Harm (HCWH) recognizes that the continuity and ongoing development of essential vaccination programs are key to achieving global public health. We also recognize the importance of responding to concerns about thimerosal in vaccines.

Thimerosal contains a kind of organic mercury called ethyl mercury, used in vaccines as a preservative. Methyl mercury, another kind of organic mercury, is a potent developmental neurotoxicant. Although not as thoroughly studied, ethyl mercury is similar enough to methyl mercury and has properties sufficient to raise legitimate concerns about its impact on the developing brains of children who are exposed to thimerosal in vaccines.

HCWH supports a precautionary approach regarding the use of thimerosal in vaccines, based on available scientific information.

- Despite the lack of conclusive scientific evidence of harm from thimerosal, enough plausible concern has been raised to justify reformulating vaccine preparations so that they do not require thimerosal.

- This conclusion is justified because organic mercury is a neurodevelopmental toxicant and there are viable alternatives to vaccine formulation without sacrificing safety or efficacy.

- Regulators, public health officials and pharmaceutical companies have recognized this and moved to phase-out thimerosal use in the U.S. and in several European countries.

- Such phase-outs, which involve switching to single-dose vaccines that do not require thimerosal as a preservative, are positive steps, but do not address the broader problem of multi-dose vaccine preparations in developing countries, where thimerosal use continues.

- In this regard, viable options for the delivery of multi-dose vaccines in developing countries should be developed as a matter of priority. This effort should be led by the World Health Organization, with participation from other intergovernmental agencies, national governments, pharmaceutical companies, international NGOs and foundations.

SHIFTING SUPPLY

Toward Production of Mercury-Free Health Care Devices

With demand shifting dramatically away from mercury-based medical devices in the United States and Europe, and with growing numbers of hospitals, health care systems, local and national governments beginning to shift demand in Asia, Africa and Latin America as well, the end is near for the mercury-based medical devices industry.

Markets for the mercury devices are drying up. Increasing numbers of medical device manufacturers are producing digital thermometers as well as digital and aneroid sphygmomanometers. These alternative devices are readily available in most countries. For instance, Health Care Without Harm South East Asia documented dozens of digital thermometers, as well as aneroid and digital blood pressure devices that were accessible in the region.[78] As the demand for alternatives increases, the economies of scale will only grow, and the price for digital and aneroid devices will drop.

This has been the case in a number of industrialized countries. For instance, in the United States, Welch Allyn and Trimline, two of the leading domestic mercury sphygmomanometer manufacturers, have eliminated the sale of mercury devices. The increasing demand for mercury-free devices is already also driving down prices for alternatives in places like Europe. The EU Commission now predicts that substitution will not bring with it significant cost increase. Market expansion is also increasing the number of competitively-priced options for healthcare facilities.[79]

The largest obstacles to this change, and simultaneously the greatest hope for it, are the industries of China, India and possibly Brazil. There is already at least one factory producing high-quality digital thermometers in India, yet it produces almost exclusively for export, and its pricing is currently out of reach for much of the country's health care sector.

There is a small but growing alternative device industry in China. And the majority of mercury thermometer and sphygmomanometer producers in the country are working to develop substitute products. But as the Chemical Registration Center of SEPA, China's environmental protection agency notes, the majority of these new products still "have high prices and unstable performances." As SEPA concludes:

> The key to reduce the mercury consumption by medical devices is to accelerate the development of mercury-free electronic and mechanical substitute products of high quality and low price. Only through large-scale domestic production and diversity of mercury-free substitute products, can China's pace for substitute be expedited.[80]

SEPA suggests a series of policy measures that could foster the development of a mercury-free medical

devices industry in China by addressing both supply and demand. These measures include:

- Improve the accuracy and quality of the devices so that the government can pass policies promoting them "as a clinical diagnosis standard."

- Increase the production tax on mercury-based medical devices over a 5-10 year period, "which will gradually diminish the price advantage enjoyed by mercury-containing products."

- Pass laws to gradually prohibit the sale of mercury-containing thermometers and sphygmomanometers.

- Design a reduction plan for mercury-thermometer export "so as to gradually reduce/eliminate such export."

If the Chinese government were to implement such policy recommendations, and the Indian government were to do the same, a fundamentally dirty industry, producing a hazardous product could be transformed into an engine for sustainability and environmental health.

Key to reducing health care's mercury consumption: accelerate development of high-quality, low-cost alternatives.

SEPA, Chinese Environment Protection Agency

Photo: Anna Gilmore Hall/HCWH

Health care leaders from developing countries have called for a global treaty as key to reducing global mercury supply and demand.

Toward a Global Treaty on Mercury

Because mercury is a pollutant that is subject to global, long-range transport, no government, acting alone, can effectively protect the health of its people (especially its children) from mercury exposure.

In the mid-1990's, the world's governments negotiated a global, legally-binding instrument to control and eliminate releases of persistent *organic* pollutants (POPs) based on a similar argument. Now, this argument is gaining momentum as a justification for establishing a global regulatory regime to control and minimize releases of mercury and possibly to also control other *inorganic* pollutants such as lead and cadmium.

In February, 2007, the UNEP Governing Council, at a meeting in Nairobi, Kenya, debated the need for international action on mercury. In its decision, the governments attending the meeting recognized that current efforts to reduce global risks from mercury are not sufficient. They concluded that further long-term international action is required to reduce risks to human health and the environment from mercury.

The UNEP Governing Council established priorities for action on mercury:

- Reduce atmospheric mercury emissions from human sources;
- Find environmentally sound solutions for the management of waste containing mercury and mercury compounds;
- Reduce global mercury demand related to mercury use in products and production processes;
- Reduce global mercury supply, including considering curbing primary mining and taking into account a hierarchy of sources;
- Find environmentally sound storage solutions for mercury;
- Address the remediation of existing contaminated sites affecting public and environmental health;
- Improve knowledge about Mercury emissions, supply and use; Human and environmental mercury exposure; Environmental monitoring data; and Socio-economic impacts of mercury use, emissions and controls.

The UNEP Governing Council further decided to bring together governments, regional economic integration organizations and stakeholder representatives to consider options for enhanced voluntary measures for addressing mercury, and also options for new or existing international legal instruments addressing mercury.[82]

CONCLUSION

Envisioning Mercury-Free Health Care

Mercury-free health care is not only possible, but if the right forces converge, the day is not far off when in most hospitals around the world, mercury-based medical devices will be a thing of the past.

With Europe and the United States already well on the road to mercury-free health care, shifting the production and consumption patterns in the Global South is the largest remaining challenge to this transition.

As this paper has documented, there are an emerging set of initiatives in a series of developing countries that can serve as models for such a change.

Hundreds, if not thousands of hospitals in countries ranging from Brazil, to the Philippines, to South Africa have already made the switch. In the future, the number of mercury-free health care facilities will only grow. Their experiences –the strategies they have employed to facilitate change and the obstacles they have faced-can help inform health care sectors throughout the developing world.

As we have also seen, a series of policy measures at the municipal, provincial/state, and national levels are also emerging. These initiatives, which are moving entire public (and often private) health care systems toward mercury-free health care, can serve as shining examples of change, ready to be replicated by other cities, provinces and federal governments across the planet.

Often, these successes have been helped along with support from NGOs such as Health Care Without Harm and our many partner organizations around the world. And often, these successes are in part accomplished by financial support, in the form of partnerships with United Nations agencies such as UNEP and aid agencies like the U.S. EPA, as well as in the form of support from philanthropic foundations. All of this support has the effect of stimulating progress by demonstrating that mercury-free health care is possible.

The movement is undoubtedly growing. For instance, as this report was going to press in October 2007, a resolution on control of mercury pollution was passed from committee to the World Medical Association's Council and General Assembly at a meeting in Copenhagen. The resolution was approved for distribution and discussion amongst the world's national medical associations. It will be acted upon with final adoption likely at the 2008 Assembly meeting in Seoul, Korea.

We are approaching a tipping point that could be realized within the next five years. Under this scenario, as demand for the alternatives significantly increases, markets will begin to shift. Economies of scale will be activated, the price of accurate digital and aneroid devices will come down, and mercury-free health care will become the dominant paradigm in most health care systems around the world.

Strategically placed bilateral and multilateral aid could help assure and hasten this transition. Such aid is crucial not only in terms of supporting ministries of health and local governments by subsidizing the initial switch, but also by fostering the necessary shift in the medical devices industry itself.

Indeed, international financial institutions and bilateral aid agencies could make a huge difference with relatively little money if they were to provide support for shifting both supply of and demand for alternative devices. Multilateral or bilateral subsidies, loans, investment guarantees and similar support can help jumpstart the production of high quality, low cost digital and aneroid thermometers and sphygmomanometers in countries like China, India, Brazil, and elsewhere. The evolution of such an industry must be accompanied by the development of international standards that allow hospitals to access certified high quality devices.

Fostering an alternative device industry should, of course, be done thoughtfully, so that mercury is not just replaced with another persistent, bioaccumulative toxic problem. The full life cycle of a digital thermometer and blood pressure device should be taken into account. The least hazardous chemicals possible should be used. And proper disposal procedures should be implemented from cradle to grave, so as to protect workers on the shop floor, communities surrounding production facilities, health care providers, patients and consumers, and those charged with disposal. This approach should include the batteries for such digital devices, which often contain small amounts of mercury, lead or cadmium.

Furthermore, the development of ongoing small to medium sized grant programs to promote awareness-raising, health care worker training and the purchase of alternative equipment is key for continuing to support the transition and to foster growing demand. Also necessary in this regard is financing for appropriate long-term storage and disposal of mercury waste, including dental amalgam byproducts.

Despite all of this momentum toward change in the health care sector, mercury will still remain a serious threat to global environmental health as long as its trade and movement is unfettered in the world economy. Ongoing, unrestricted global trade in mercury and mercury products such as thermometers will also undermine efforts to phase-out mercury in health care.

It is important to recognize that in those areas of the globe that are able to afford and allocate public health monies toward environmental health issues, the life-cycle costs of mercury are typically accounted for. These countries have been able to inform their citizens about environmental health hazards such as mercury or other hazardous chemicals. Invariably, when HCWH provides trainings to healthcare workers across the globe, the new awareness about the hazards of mercury creates a visceral call to action. These workers often wonder why they and their institutions have essentially become toxic dumping grounds, often starved of financial resources in a world economy bent on health care privatization and corporate globaliza-

tion; they wonder why they are still exposed to hazards that the North has all but eliminated.

In short, eliminating mercury in health care is also an issue of equity. As we advocate for mercury-free healthcare, we must recognize that all citizens are affected by mercury and similar global toxins. Accordingly, a global treaty is essential from not only an environmental, but also an ethical perspective.

To many, this kind of thinking is already common sense. It is not surprising then, that the participants in the first two regional conferences for mercury-free health care organized by Health Care Without Harm in association with the UN Environment Programme in South East Asia and Latin America agreed to "advocate for a legally binding international instrument …so as to substantially reduce the global mercury supply and demand."[81]

Health care leaders can play an important role in their societies regarding mercury and other similar environmental health threats. They can be spokespeople, advocating for international action on a global environmental health threat like mercury. And by cleaning up their "house" –by making hospitals and the health care sector sustainable and healthy rather than a source of harm to human health and the environment– they can set an example which can be admired and emulated by others in different sectors of society.

By proving that mercury-free health care is possible, doctors, nurses, hospital managers, government officials and health care advocates can shine a leading and inspiring light on the possibility of a world free of mercury pollution.

Initiatives for mercury-free health care are catching on across the globe. Doctors and nurses gathered in Penang, Malaysia for a workshop on alternatives.

Photo: Faye Ferrer

Health care leaders can provide inspiration for a world free of mercury pollution.

NOTES

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9. "Making Medicine Mercury-Free, A Resource Guide for Mercury Free Medicine" in *Going Green: A Resource Kit for Pollution Prevention in Health Care,* Health Care Without Harm, Arlington, June 6, 2007, http://www.noharm.org/goinggreen

10. U.S. Environmental Protection Agency,1996, Mercury Study Report to Congress, Science Advisory Board Review Draft, Vol.2, p. 4-19, p. ES-3.

11. Presentation by Dr. Dra. Adriana Grebnicoff, Ministerio de Salud del GCBA, Coordinación de Salud Ambiental, Primera Conferencia Latinoamericana sobre la Eliminación del Mercurio en el Cuidado de la Salud, Buenos Aires, August 5, 2006.

12. The Buenos Aires city health care system has 8,000 beds and has used 40,000 mercury thermometers per year or 5 thermometers per bed per year. Argentina's population is 40.3 million; there are 244 people to every hospital bed (Source: Encarta online) which equals roughly 165,200 hospitals beds in the country. 165,200 x 5 = 826,000 thermometers. 1 gram of mercury per thermometer; 100 grams per kilo.

13. HCWH/CAATA, "Progress Report to the Commission on Environmental Cooperation: Partnership Project to Reduce Use, Discharges and Emissions of Toxic Substances in the Healthcare Sector in Mexico, With an Emphasis on Mercury Reductions," Mexico City/Buenos Aires, July 2007.

14. Mabeth Burgos Hernandez, *What Does Sonoran Health Care System Require for Toxic Use Reducción Approach Implementación? Fundamental and Initial Research to Introduce Toxic Use Reduction* Doctoral Dissertation, Centro de Estudios Superiores del Estado de Sonora, CESUES, 2007

15. Mexico has one acute care hospital bed per 1,000 people (source: OECD Health Data 2005 http://www.oecd.org/dataoecd/16/2/34970198.pdf). The population of Mexico is 103 million. 103,000 = 988,800 per year. Each thermometer contains approximately 1 gram of mercury x 988,800 = 0.98 metric tons.

16. HCWH/CAATA, "Progress Report," July 2007.

17. *Lurking Menace: Mercury in the Health Care Setting,* Toxics Link, New Delhi, June 2004

18. Prashant Pastore, Ratna Singh, Dr. Nidhi Jain *Mercury in Hospital Indoor Air: Staff and Patients at Risk,* Toxics Link, New Delhi, January 2007.

19. Calculation is based on Toxics Link figure of 70 breakages a month (extrapolated to 840 a year) in a 400 bed hospital. This averages out to 2.1 thermometers per bed. India has 10 hospitals beds for every 10,000 people and a population of 1.13 billion people.

20. Cited in "A New Era: The Elimination of Mercury Sphygmomanometers," in *Going Green, A Resource Kit for Pollution Prevention in Health Care,* Health Care Without Harm, Arlington, http://www.noharm.org/library/docs/Going_Green_2-9_A_New_Era_The_Elimination_of_M.pdf

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