



**TASK FORCE
ON
RITUALISTIC USES OF MERCURY
REPORT**

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TASK FORCE ON RITUALISTIC USES OF MERCURY REPORT



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THE OPINIONS EXPRESSED IN THIS REPORT ARE THOSE OF THE TASK FORCE MEMBERS AND OTHER PARTICIPANTS IN ITS ACTIVITIES. THEY ARE NOT NECESSARILY THE VIEWS OF THE ENVIRONMENTAL PROTECTION AGENCY, THE AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY, THE CONSUMER PRODUCT SAFETY COMMISSION, OR ANY OTHER PARTICIPATING ORGANIZATION.

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EXECUTIVE SUMMARY

The U. S. Environmental Protection Agency's (EPA) Office of Emergency and Remedial Response (OERR) convened the Task Force on Ritualistic Uses of Mercury in January 1999 to recommend an appropriate course of action regarding the use of elemental mercury as part of certain spiritual practices and folk traditions. In forming the multi-agency task force, EPA hoped to gain a better understanding of these practices and traditions and their potential public health and environmental impacts. This report summarizes the Task Force activities, provides an overview of what is known about cultural and spiritual mercury use, and makes recommendations for further investigation, outreach, and action.

Scope of Problem: Availability, Use, and Exposure

In many urban areas in the United States, religious supply stores known as *botanicas* sell a variety of herbal remedies and religious items used in certain Latino and Afro-Caribbean traditions, including Santería, Palo, Voodoo, and Espiritismo. The involved religions evolved from native faiths brought to the New World by African slaves. It is important to note that these religious practices were vigorously suppressed by the slave owners over hundreds of years. Their survival, in fact, was only assured by disguising them as European religions. Thus, many of the religious figures and deities were renamed after Catholic saints, but retained many of the roles consistent with the original African beliefs. It is not surprising that after so many years of religious oppression, these groups might be sensitive toward scrutiny by those in authority.

A number of studies have documented mercury's availability for purchase in many *botanicas*. Mercury is used to attract luck, love, or money; to protect against evil; or to speed the action of spells through a variety of recommended uses, including wearing as amulets, sprinkling on the floor, or adding to a candle or oil lamp. It is sometimes taken internally to treat gastrointestinal disorders, or added to detergent or cosmetic products. Data gathered to date on availability and use of mercury are largely based on self-reports, with small or non-representative samples. Not enough attention has been given to characterizing populations that use mercury. The extent of use across the population, and typical use patterns for individuals are still unknown. Little is known about how mercury is supplied to *botanicas* for retail sale. Scientific aspects, such as the fate and transport of mercury vapor indoors, are also not well understood. There is no clinical data that confirms that people who use mercury for cultural and spiritual purposes (and people who share their living space) have elevated mercury levels. However, no one has formally studied this question, and socioeconomic and political barriers inhibit reporting of health problems related to cultural and spiritual mercury use. Actual measurements of mercury concentrations in indoor air in *botanicas* and residences are also necessary to gauge the severity of the problem, and to relate source and exposure data.

Nonetheless, mercury's volatility and long residence time indoors create a potential for direct inhalation exposures to individuals from these uses. Mercury is difficult to remove from home materials, and small amounts can lead to contamination for extended periods of time. Its widespread availability in *botanicas* suggests that indoor mercury exposure may be a problem for some users and their families.

Health Effects

In short-term exposure (on the order of hours), mercury first affects the respiratory system and can result in pneumonitis, severe bronchiolitis, pulmonary edema, and/or death. With smaller doses over a longer period of time (e.g., occupational exposure where workers are exposed for many years), neurologic effects predominate. These effects may include intention tremors, emotional lability, insomnia, memory loss, neuromuscular changes, headache, ataxia, polyneuropathy, and deterioration of performance in tests of cognitive function. Because of their variability and nonspecificity, these chronic neurologic effects may be misdiagnosed as behavioral or psychiatric disorders. The long-term health effects in children with elevated urine mercury levels have not been well studied. However, for any given overall household air concentration, children may be at higher risk of toxicity than adults.

Measurement of inorganic mercury in the urine is the most widely accepted method of monitoring for toxic levels of exposure and most closely reflects the body burden of the substance, especially in chronic exposures. However, for a number of reasons, interpretation of urine mercury levels is not always straightforward. Although a number of studies have found adverse neurotoxic effects at higher urinary mercury levels, the lowest mean chronic urinary mercury levels at which adverse health effects have been demonstrated in humans are close to the upper background value of 20 micrograms per liter ($\mu\text{g/L}$).

Task Force Recommendations

A number of federal, state and local agencies have acted over the past decade to gain a better understanding of the problem and to reduce mercury exposure from spiritual and cultural practices. Actions have included informal and formal information gathering, meetings with community groups, production and distribution of health alerts and outreach materials (including fact sheets, sample labels, Web sites, brochures, radio announcements, and press releases), investigation of complaints, research funding, risk assessments, voluntary product recalls, measurements of mercury air levels in *botanicas* and surrounding living areas, and enforcement of applicable regulations, ranging in scope from letters to potential violators to a 1991 order banning the packaging of mercury in small vials for sale in Puerto Rican *botanicas*.

The Task Force recommendations seek to reduce mercury exposure by recommending realistic and cost-effective actions that will promote health and well-being while respecting cultural traditions and community autonomy. The Task Force recommends approaches that rely primarily on community outreach and education activities to inform mercury suppliers and the public about mercury's risks, and encourage the use of safer alternatives. Because there continues to be a paucity of data on the extent of use of mercury for these purposes, the fate and transport of mercury indoors, and the exposure that might result from these uses, the Task Force prioritized a number of areas for further study and research. The Task Force recognizes there are many competing priorities for research, and that government agencies, and non-governmental organizations must balance these recommendations against other existing priorities. The Task Force made the following recommendations:

I. Community Outreach and Education

A coordinated effort between state and local health departments and local community organizations can help inform mercury suppliers and the public about mercury's risks. Federal agencies can play a supportive role in these activities.

EPA/OERR

1. Develop a brochure on mercury describing its hazards and what to do if mercury is spilled. This brochure will serve as a template that can be used by local groups in designing their own communications. The brochure is intended primarily for distribution via the Web.
2. Produce a written statement for distribution to community groups on the do's and don'ts of mercury use. This was widely requested by forum participants, this "official message" should also include messages from the brochure and emphasize the importance of community leaders in outreach.
3. Encourage funding to assist community-based organizations (CBOs) and local health departments involved in outreach and education activities.
4. Work with various EPA offices to incorporate mercury in existing education programs, where appropriate. Because of the perceived success of programs addressing lead and asthma, there was general support for incorporating the issue of mercury and its health effects into existing programs in the Office of Children's Health, the Office of Indoor Air, and the Office of Toxics. It would be particularly effective to add cultural mercury use issues to the indoor air hotline, and to EPA's Tools for Schools kit.

Agency for Toxic Substances and Disease Registry (ATSDR)

1. Encourage state and local health departments to partner with CBOs in their area and develop an effective outreach strategy.
2. Encourage the addition of the issue of mercury to existing education programs, where appropriate. There was general support for incorporating the issue of mercury and its health effects into existing programs that deal with similar health issues, such as Indoor Air Quality Programs (e.g., carbon dioxide and lead); Asthma Programs; and Prenatal Care Programs. The Woman, Infants, and Children (WIC) approach is a good model. Mercury exposure questions should be included on the National Health and Nutrition Examination Survey (NHANES) and the Hispanic Health and Nutrition Examination Survey (HHANES). Secondhand exposure should be included in another line of questioning, such as how long has the exposed person lived in their residence, etc. Early education childhood prevention programs should follow or be attached to lead questions.

Regions/Local Health Departments/CBOs

Plan, implement, and evaluate local education and outreach activities. Much of the outreach and education on mercury use is necessarily local. Forum participants agreed that grassroots education efforts are most likely to be effective. Although federal agencies can provide general guidance about the content of a warning message about mercury use, it is up to state and local health departments working with CBOs to tailor the message to the local audience and deliver the message effectively. The collective wisdom compiled from the participants in the forum on Ritualistic Uses of Mercury on conducting outreach and education can be found in section 4.5. There was consensus that partnerships between local and state health departments and CBOs are most effective at promoting mercury programs.

Community-Based Organizations

1. Communicate with publishers and authors of religious/spirituality books that contain mercury spells, to request inclusion of a specific note about the risks of using mercury and how to reduce risk in practice – or a consideration of alternative spells that use non-toxic substances.

II. Research Agenda

The following key research areas should be prioritized against other existing priorities:

1. Clinical studies to identify elemental mercury levels in people. Ideally, levels of mercury would be examined in the bodies of mercury users versus a control group. Twenty-four hour urine mercury samples could be obtained rather than spot samples, and the mercury could be speciated. Follow-up would connect exposures to particular sources and use patterns. Given the real-world constraints imposed by funding issues and the stigma associated with cultural mercury use, some modifications will have to be made. For example, anonymity and the convenience associated with spot-urine sampling are needed to attract participants. A simplified research strategy might only consider base screening mercury levels in Latino and Caribbean communities versus other communities. Although researchers should strive toward detailed measurement studies where possible, the studies should, at a minimum, measure the incidence of exposure and impact of mercury on the community. Incorporation of mercury tests into other routine tests – for example, child blood-lead levels – might be an effective way for local clinics to collect useful data. ATSDR has Institutional Review Board (IRB) guidelines that govern clinical studies involving human subjects, and these must be followed for any clinical study.
2. Ethnographic research to identify the needs, beliefs, use and exposure patterns in specific subpopulations, and to understand the frequency and extent of different uses, sales rates, and mercury supply chains. Such research would better characterize the mercury-using population, illuminating how mercury is used and its exposure implications, as well as its cultural meaning or significance. Identifying safe alternatives for mercury used by practitioners in a variety of cultural and religious contexts is also desirable. Participant observation should be a particularly effective research tool for this work.

3. Risk perception and risk communication research that evaluates the effectiveness of communication materials and outreach strategies, and provides input for improved designs for both. Market research approaches are also valuable here in understanding the audience and designing salient messages with immediate practical application. Stakeholders should be involved in ongoing discussions of risk management, and in the design and evaluation of risk communication materials.
4. Fate and transport studies of mercury in indoor air to better relate cultural use to acute and long-term exposure levels, and to develop models to predict indoor concentrations and residence times. Air measurements in vehicles, residences and *botanicas* are needed to validate these models and measure typical exposure levels stemming from cultural and religious uses.
5. Epidemiology and toxicology studies aimed at understanding low-level health effects of mercury and exploring novel biomarkers for exposure assessment are needed. Small grants (such as those provided in the past by ATSDR and EPA Regions 2 and 5), will be sufficient and effective for sharing key information for most of these studies. Priority should be given to proposals that represent true collaborations with active involvement of community groups with demonstrated access to exposed populations. Private foundations may be a source for funding on this issue. Some academic professional organizations in sociology and anthropology may provide small grants for new projects in this field. Finally, the federal and state health care and clinical health community may be an additional funding source for many of these studies. The Office of Minority Health in the Department of Health and Human Services, for example, may have an interest in some of these research areas.

III. Environmental Monitoring

EPA

1. Provide guidance on the use of generally accepted ambient levels of mercury.
2. Provide guidance on instruments and detection limits to use when sampling for mercury. The NIOSH 6009 method is the standard method used to monitor for mercury. Newer instruments have been developed that are more portable, and can provide faster and cheaper measurements. Guidance is needed on the use of these newer instruments to ensure their precision and accuracy when compared against the standard NIOSH 6009 method.
3. Provide guidance on action levels of mercury.

IV. Technical Assistance and Response

1. Any clinical response must meet ATSDR's criteria for an environmental health intervention and would require environmental data that would meet the criterion for a public health hazard. If these conditions are met, a response framework would be constructed. ATSDR is prepared to provide guidance in public health practice through ascertaining the public health implications of exposure scenarios and the development and adaptation of the current response strategy. ATSDR

is ready to assist in developing an integrated risk management protocol based on environmental and biological sampling, should one become necessary in the future. Any cleanup response to mercury releases on the Federal level must be pursuant to the legislative and regulatory authorities of Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA).

PREFACE

The U.S. Environmental Protection Agency (EPA) convened the Task Force on Ritualistic Uses of Mercury in January 1999 to recommend an appropriate course of action regarding the use of elemental mercury as part of certain folk practices and religious traditions. In forming the multi-agency Task Force, EPA hoped to gain a better understanding of these practices and traditions and their potential public health and environmental impacts. This report summarizes Task Force activities, provides an overview of what is known about cultural and spiritual mercury use and makes recommendations for further investigation and outreach.

Mercury is a well-known and much-studied toxic substance. The Task Force designed its work to complement EPA's broader agenda to reduce mercury in the environment. These EPA efforts focus primarily on reducing: 1) releases from coal fired power plants, 2) consumption of methylmercury in fish, and 3) the use of mercury in schools and medical facilities. Indoor domestic exposure to mercury vapor is of significant concern because of its potential for direct impact on human health. A variety of sources can lead to domestic exposure, including improperly removed gas pressure regulators, broken thermostats and thermometers, mercury manometers, and children releasing stored mercury. In response to repeated requests from Dr. Arnold Wendroff of the Mercury Poisoning Project in Brooklyn, New York, EPA formed the Task Force to gain a better understanding of cultural and religious uses of mercury.

The Task Force identified the following purposes as its scope of work:

- To share information about ongoing efforts to evaluate the extent of the problem and related education and outreach activities;
- To recommend a research agenda to better define the extent of distribution and problems resulting from cultural and spiritual uses of mercury;
- To recommend a community-based strategic plan for education and outreach activities that informs users and those exposed to mercury of the hazards of cultural and spiritual uses of mercury and that encourages reduced exposure; and
- To recommend public health and environmental management protocols, if needed. The protocols would cover health education activities and outreach to affected populations, and identify tiers of action to determine if a response is needed. The protocols would identify a broad base of organizations and agencies who could assist in implementing the protocol.

Accordingly, this report presents the current state of knowledge about these practices and their health effects, discusses the key areas where additional knowledge would be a helpful guide for decision makers, and develops a framework for a community-based public health plan addressing cultural mercury uses.

Report Organization

This report is organized into six chapters. Chapter 1 gives an overview of the problem in its cultural and political context, identifying the practices involved and the exposures that can result. Chapter 2 provides detailed background on the health effects of mercury exposure. Chapter 3 discusses the

policy history of cultural and religious mercury use, detailing actions of federal, state, and local agencies since 1990. Chapter 4 describes the activities of the Task Force, including the forum it hosted in May 2001. Chapter 5 evaluates the full range of options available to regulators in addressing this issue, with a focus on EPA, and the likely consequences of each action. Chapter 6 recommends a course of action for research and outreach.

ACKNOWLEDGMENTS

A great number of people have contributed to the work of the Task Force.

First, Peter Redmond, Allen Maples, and Geri Bell served the Task Force as Chairs, providing leadership and guidance in our discussions and actions. Laurie Ann Columbo served as chair of the Outreach and Education subcommittee, Erik Auf der Heide as chair of the clinical intervention subcommittee, and Clyde Johnson and Craig Beasley as chairs of the environmental sampling subcommittee. We thank Suzanne Wells for her support of the Task Force's activities.

Several people contributed to the writing of this report. Donna Riley, an American Association for the Advancement of Science (AAAS) fellow at EPA wrote the bulk of the report. Erik auf der Heide wrote Chapter 2 in its entirety. Maureen Lichtveld contributed the framework for the outreach and education recommendations. Clyde Johnson contributed the discussion on environmental monitoring. Karen L. Martin incorporated final comments on the report, and prepared it for printing.

The Task Force built on the foundation of work done previously at EPA by Mary Dominiak, Greg Susanke, Andrea Blaschka, and Sam Gutnik in OPPTS, and Kim Fletcher in CIOC. We are grateful for their continued assistance.

We are grateful to the community members who took the time to meet with Task Force representatives at the National Alliance for Hispanic Health, the Temple of Yehwe, the League of United Latin American Citizens, the Latin American Youth Center, the Pan-American Health Organization, and the American Public Health Association. We acknowledge with gratitude the hard work of Dr. Arnold Wendroff of the Mercury Poisoning Project, a tireless advocate for more than a decade, who first brought national attention to this issue; without him this Task Force would not have existed.

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We acknowledge on the following two pages the active participants in Task Force activities, and many others who have supported our work.

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1. PRACTICES AND EXPOSURE

1.1 Terminology and Focus

The Task Force on Ritualistic Uses of Mercury initially chose the term “ritualistic” to refer to uses of mercury that are ceremonial or religious in nature, or that occur according to social custom. Although this is exactly what the term ritualistic means, the Task Force discovered in the course of its work that the term seems to carry some negative connotations that were not intended.

Although the Task Force has retained its name, the language in this report consistently refers to “cultural,” “religious,” “folk medicinal,” and “spiritual” uses of mercury, as preferred language, recognizing that this language is also imperfect.

Although the Task Force remains concerned about mercury exposure stemming from uses in any cultural or spiritual tradition, its attention was drawn to the widespread availability of mercury in *botanicas* – shops that supply folk medicines, religious artifacts, and other cultural goods in Latino and Caribbean communities.

1.2 Availability

In many urban areas in the United States, religious supply stores known as *botanicas* sell a variety of herbal remedies and religious items used in Latino and Afro-Caribbean traditions, including Santería, Palo, Voodoo, and Espiritismo. Many *botanicas* sell mercury (also called *azogue* or *vidajan*) for individual use in homes, as part of these traditions.

A 1995 survey of 41 New York *botanicas* found that 38 reported selling mercury, most of them at a rate of one to four capsules a day[1]. An earlier survey of 115 *botanicas* in 13 cities in the United States and Puerto Rico found that 99 sold mercury[2]. The Chicago Department of Public Health visited 16 *botanicas* in local Latino communities; all 16 sold mercury in capsules (average weight of ½ oz.)[3]. Twelve of the *botanicas* sold the mercury without any sort of labeling. The other four provided English and Spanish warning labels, although the information was incomplete.

As awareness of mercury exposure has increased in certain areas through the efforts of public health officials, researchers have found that mercury is more difficult to obtain from *botanicas*. However, the sale of mercury seems merely to have been driven underground, so that establishing oneself as an insider will substantially increase the likelihood of a mercury sale, either on site or at a secret location[4].

Mercury is commonly sold in a large gelatin capsule that contains, on average, about 9 grams of the metal[2]. Larger quantities are less commonly sold in small jars or plastic bags.

In addition to *botanicas*, plumbing supply stores sell elemental mercury for use in manometers. Mercury may also be available through mail order, over the Internet, and in some hardware stores and markets, called *bodegas*, in Caribbean and Latino neighborhoods.

The availability of mercury needs to be better characterized. To properly characterize the extent of exposure, more information is needed to estimate the volume of mercury sales, the number of *botanicas* that sell mercury now (the limited studies available are several years old), and the amount purchased per customer. Based on a recent report in the Chicago Sun Times, mercury sales appear to have declined[5]. Have mercury sales actually slowed there, or have they moved underground? How has this change affected the extent of mercury use in that community? More generally, how is mercury availability related to its use? All of these questions need further investigation.

1.3 Uses

Mercury is used in a variety of ways to attract luck, love, or money; to protect against evil, or to speed the action of spiritual works, as proposed by spiritual or folk traditions. Popular books on Santería feature “recipes” for spiritual works that contain mercury[6],[7]. Zayas and Ozuah[1]found that *botanica* personnel most commonly recommended carrying mercury as an amulet in a sealed pouch (49%) or pocket (32%), or sprinkling mercury in the home (29%). A survey of Latin American and Caribbean residents of the Bronx[8]reported these uses as well as burning mercury in a candle, mixing it with perfume, and sprinkling it in the car. Wendroff[2]reported that 13 of 28 New York *botanicas* prescribed sprinkling mercury indoors. Ingestion of mercury has also been documented in Mexican American communities as a treatment for the culturally bound intestinal disorder empacho[9],[10]. Mercury is sometimes mixed with water or other liquids and used to clean the home, added to spiritual baths, or placed under the bed in a cup of water[1, 2, 4, 8].

The extent of mercury use is unknown, but several studies have collected data that indicate its use is prevalent in some areas. Johnson[8]surveyed 203 Latin American and Caribbean adults in New York City; 44% of Caribbean and 27% of Latin American respondents reported mercury use. Six percent of Latin American and 12% of Caribbean mercury users said they used it daily; 54% of Latin American and 50% of Caribbean mercury users said they used it occasionally. It is of interest that nearly two-thirds of the user and non-user respondents (with no significant difference between the two groups) said they would welcome having indoor air measurements or biological testing for mercury. Eighty-two percent said they obtained elemental mercury from a *botanica*; 3% brought it with them when they emigrated to the United States; 6% got it from their job, a pharmacy, their landlord, or their parents; and 9% did not specify a source.

A survey in Hartford Connecticut, conducted by the Hispanic Health Council, found that of 108 Latino and West Indian residents of Hartford, only 8% reported using mercury, while 17% knew of its use. Of 10 spiritists and folk healers interviewed, only one reported currently using mercury in the home, although all knew about the practice (Toal B. Connecticut Department of Health. Personal Communication, August 2, 2001.). Zayas and Ozuah[1]found that the source of recommendation for mercury use was reported as a family member (39%), spiritualist (39%), or friend (37%), while *santeros* (Santería priests) were mentioned by only 10%. In a survey of 79 Latino residents of Chicago, Illinois, 16 (1 male, and 15 females) reported that they had used metallic mercury on several occasions. Half knew someone outside of the family, who used mercury and one-fourth knew someone within the family, who it. One of the 16 reported current use of

mercury at least once a month, three reported using it during the prior year, and 12 said they used it more than a year ago[3].

Wendroff describes in an unpublished study carried out in fall 1990 by Dr. Deborah Arbit, a chief resident at the State University of New York-Downstate Medical Center. A survey of 100 women patients, mostly Haitian and Hispanic, revealed 25% who were familiar with the spiritual use of mercury, but were not users nor did they have users in their household. One patient reported using mercury by mixing it with her cologne and applying it daily 2 years before she gave birth to a child. Her urine and that of her newborn child were negative for mercury as were cord blood and amniotic fluid. However, her breast milk was reported to contain 57 µg/L of mercury (Wendroff AP. Study of mercury use in New York City. 1999.).

Although a significant number of studies have been completed, it is difficult to draw many solid conclusions from them. Data gathered to date are largely based on self-reports. Problems identifying willing participants result in small or non-representative samples, or both. Most data have been gathered in the New York metropolitan area. Not enough attention has been given to characterizing populations that use mercury and their underlying belief systems. Mercury use is often casually attributed to Santería, without evidence that it is more prevalent in that religion than in other spiritual or cultural traditions.

There are data gaps in our understanding of mercury use. A reliable estimate of the frequency of mercury use, as well as other toxic substances such as *precipitado rojo* (mercuric oxide), *greta* (lead oxide), and *azarcon* (lead tetroxide), is still needed. Knowing the details of the location, quantities, and frequency for each type of use, as well as its cultural origins will help to reliably estimate the distribution of different uses and resultant exposure levels. Still unknown is the extent of use across the population, including uses outside of Latino or Caribbean traditions (e.g., in Hindu, Wiccan/Neo-Pagan, or new age practices), and typical use patterns for individuals.

Little is known about how mercury is supplied to *botanicas* for retail sale. In December 1992, the California Department of Health Services received a consumer complaint filed by Dr. Arnold Wendroff of the Mercury Poisoning Project in Brooklyn, New York, that metallic mercury had been sold in several *botanicas* in the Los Angeles, California, area. This matter was referred to the U.S. Environmental Protection Agency's Office of Enforcement, which learned that Los Angeles area *botanicas*, as well as retail establishments in other areas of the country, obtained mercury from a metal recycler. EPA reported that this company sold a very small percentage (the exact numbers were not specified in the report) of its recovered mercury to religious supply companies throughout the country. These companies repackage and redistribute mercury, along with other religious articles, to small business establishments (e.g., religious stores and candle shops)[11]. However, less-formal operations, such as individuals in unmarked trucks delivering small amounts to *botanicas*, also seem to be in place[4].

1.4 Alternatives to Mercury

There are many possible alternatives to elemental mercury, depending on the religious or cultural tradition and on the desired outcome. It is not possible to say that elemental mercury can always be substituted by a particular substance, because mercury has so many different uses in so many different traditions. However, for any particular use, it is usually possible to find a way to achieve the same result with less-toxic materials, if a spiritual consultant in the appropriate tradition is asked for advice. For example, where mercury is used to speed the action of a spiritual work, *sangre de dragon* (dragon's blood, a red resin obtained from the fruit of several species of *daemonorops* palms) is considered in some traditions to be a very powerful substitute, but it is not considered toxic by scientists[12]. Amulets for personal protection can be made with *agua florida* (Florida water, a perfumed water or cologne), or by carrying any of a number of medallions or curios, such as the coin of the *siete potencias* (Seven African Powers). Purification or spiritual cleansing of a home can be accomplished with *agua florida*, or various plants.

1.5 Fate, Transport, and Exposure

Mercury's volatility and long residence time indoors create a potential for inhalation exposures to individuals. Mercury is difficult to remove from contaminated buildings, and small amounts can lead to contamination for extended periods of time.

Data gathered at mercury spill events provide some bounds for expected air concentration levels. Several months after a large jar of mercury was spilled in an Ohio apartment, two children developed acute mercury poisoning, and air levels in the apartment were 50 – 400 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$)[13]. In Michigan, a 300g spill resulted in air concentrations of 10 – 40 $\mu\text{g}/\text{m}^3$ several months after the spill and acute poisoning of three children in the house[14]. Breakage of a mercury thermometer on a vinyl floor, followed immediately by cleanup of all visible beads, resulted in mercury air concentrations of 5 $\mu\text{g}/\text{m}^3$ a week later, and 0 – 2 $\mu\text{g}/\text{m}^3$ 2 weeks later[15]. No similar incidents yet reported relate to cultural and religious uses of mercury. However, no one has looked systematically for these incidents, and socioeconomic and political barriers inhibit reporting (Engblom R, EPA Region 6. Personal Communication, May 23, 2001.).

A study at Montefiore Hospital in the Bronx[16] measured mercury in the urine of 100 pediatric patients (55% Hispanic, 43% African American), and showed a 3% rate of elevated ($> 10 \mu\text{g}/\text{L}$) mercury levels. This number is similar to the 4% rate of elevated blood lead levels in the same population, indicating that the mercury exposure may warrant similar public attention.

For any given overall household air concentration, children may be at higher risk for toxicity than adults. This is because mercury vapor is denser than air and becomes more concentrated near the floor where children do more breathing. Also, when compared to adults, pediatric respiratory air exchange per unit body weight (minute ventilation per kilogram) is greater; for the same air concentration of mercury, a larger dose in the pediatric population would be expected[17],[18].

The fate and transport of mercury vapor indoors are not well understood. For example, to estimate exposure from sprinkling mercury indoors, we need to predict typical droplet-size distributions. Droplet size determines the amount of surface area that is exposed to air, and along with temperature

and ventilation rates, the amount of mercury that volatilizes. Differences in exposure estimates of several orders of magnitude can occur for the same mass of mercury with different surface areas. Similarly, the effects of temperature, humidity, and deposition rates onto walls, floor, carpet, and other indoor materials are critical determinants of mercury levels that warrant further study.

Most important, there is a need for clinical data. Do people who use mercury for spiritual and folk tradition purposes (and people who share their living space) have elevated mercury levels? Ideally, clinical studies would follow up on findings of elevated urine levels with home testing and a source assessment. Because of the stigmatization of this practice and other political and cultural factors, it has been very difficult to find volunteers for this type of study. More realistic studies might simply determine whether members of Latino and Caribbean communities in U. S. cities have elevated mercury levels. A variety of factors could contribute to a higher mercury burden in these populations, so a study would not necessarily be able to conclude that cultural and spiritual uses were responsible if higher levels were found. However, if a pattern of elevated mercury levels is found, community groups will have a greater incentive to work toward identifying and reducing all mercury sources.

1.6 Environmental Monitoring

Actual measurements of mercury concentrations in indoor air in *botanicas* and residences are needed to gauge the severity of the problem, and to relate source and exposure data. Government agencies have set standards for mercury in indoor air to protect human health. EPA's risk database gives a reference concentration (RfC) of $0.3 \mu\text{g}/\text{m}^3$ of air[19]. ATSDR minimal risk level (MRL) for chronic or lifetime exposure is $0.2 \mu\text{g}/\text{m}^3$ [20](no intermediate exposure MRL has been developed). The reference concentration and MRL are not meant to be used as hard and fast rules for action; they represent conservative estimates of exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of adverse health effects during a lifetime. The Occupational Safety and Health Administration's (OSHA) ceiling limit (which shall not be exceeded at any time) is $100 \mu\text{g}/\text{m}^3$ [21], and the National Institute for Occupational Safety and Health (NIOSH) recommends an 8-hour time-weighted average (TWA) of $50 \mu\text{g}/\text{m}^3$ [22]in occupational settings. These standards were set in the early 1970s, and more recent 8-hour TWAs have been set by the American Council of Governmental Industrial Hygienists (ACGIH) in 1996 at $25 \mu\text{g}/\text{m}^3$ [23].

Methods for establishing mercury exposure measurements can vary at the state and local level, because equipment availability and cost considerations impact measurement protocol. Different technologies produce measurements with different levels of scientific uncertainty, which can affect decision-making about appropriate responses. Although the above standards guide decision makers, other site-specific variations are also considered, such as the time-activity patterns of building occupants, and the sensitivity of the population exposed.

The Jerome meter is a hand-held device that gives real-time readings of mercury in indoor air. An air sample passes through the instrument, and the electrical resistance of a gold film sensor inside increases in proportion to the concentration of mercury and mercury compounds in the air.

The Jerome is fast but loses accuracy at low levels ($< \text{about } 10 \mu\text{g}/\text{m}^3$). It has a number of interferences that make its use in a cultural and religious exposure setting problematic. For example, the presence of smoke and nitrogen compounds, including ammonia, can create falsely high readings. Such compounds are likely to be present near an altar or in a *botanica* where candles are frequently lit and burned for hours.

The NIOSH 6009 method is recognized as a highly accurate measurement protocol for mercury in indoor air, but it requires lengthy sample times (8- hours standard), and the sample must be sent to a lab for analysis using atomic absorption spectrophotometry. Atomic absorption spectrophotometry can produce accurate readings at very low concentrations (certainly below the MRL of $0.2 \mu\text{g}/\text{m}^3$). Unfortunately, the NIOSH method is time-consuming, and it can be inconvenient for building occupants.

Thus, the Jerome is useful for exploratory readings and source identification, but the NIOSH method is often needed to determine what further actions might be necessary, and to verify cleanup levels. Typically, when using the Jerome meter, indoor air concentrations $>10 \mu\text{g}/\text{m}^3$ can result in a decision to isolate residents from the exposure, and conduct an investigation to identify any sources of mercury in the home (appropriate response actions follow if necessary). For readings $<10 \mu\text{g}/\text{m}^3$ that the Jerome still registers as non-zero (typically $>3 \mu\text{g}/\text{m}^3$), further analysis (e.g., with the NIOSH method) is needed to get an accurate determination of mercury levels. In fact, further analysis may even be necessary with a non-detect on the Jerome, because of the instrument's level of sensitivity. Because cleanup goals may be set at or below $1.0 \mu\text{g}/\text{m}^3$, it is not possible to use the Jerome reliably for verification of cleanup.

Recently, a number of new hand-held instruments with greater sensitivity, were introduced into this complicated decision-making landscape. These instruments can provide accurate real-time readings $<10 \mu\text{g}/\text{m}^3$ (some claim sensitivities as low as $0.002 \mu\text{g}/\text{m}^3$). The instruments use a form of atomic absorption spectrophotometry that isolates only mercury atoms for analysis.

This increased sensitivity may allow agencies responding to mercury spills to reduce the use of the NIOSH method and simplify their decision-making processes, in some cases. However, several considerations must be taken into account. First, it will be some time before these instruments have replaced Jeromes in the arsenals of state and local agencies, so it is necessary to continue to provide guidance to decision makers facing data based on the Jerome meter. Second, the instruments' accuracies must be more thoroughly tested against the NIOSH method to determine when and how they can be appropriately used. Third, time-weighted average measurements are still needed to estimate exposure properly and determine the risk levels for occupants. Although some of the new instruments have a logging capability that might be used to track measurements over time, the feasibility and accuracy of using an instrument in this way needs to be investigated further.

EPA scientists are gathering the necessary quality assurance/quality control data on these new instruments, while this equipment is being used on an experimental basis.

1.7 Comparison to Other Mercury Exposure Issues

It is important to understand the scope of this problem relative to other mercury issues. A 1999 EPA analysis of domestic mercury spills found that of 19 spill reports from 1986-1998, 11 (58%) were due to children playing with mercury, 3 were related to improper or former business practices on site, 3 were inadvertent (e.g., spills), and 2 were discoveries not related to residents' actions. The total cleanup cost for these incidents was \$6 million (range per incident was \$3,300 to \$3.4 million). No reported spills listed cultural and religious mercury use as a source of exposure[24].

ATSDR's Hazardous Substances Emergency Events Surveillance System tracks mercury releases in 16 participating states. An analysis of data from 1993-1998 shows that of 390 reported "fixed facility" (non-transportation) events involving mercury only, 65 (17%) occurred in private residences, 80 (21%) occurred in schools and universities, and 64 (16%) occurred in health care facilities. Causal factor data were available for 46 of the domestic events, with 33 stemming from human error, 6 from equipment failure (e.g., thermometers, gas pressure regulators, blood pressure devices), 4 from "deliberate" damage, and 3 due to other causes. Cultural and spiritual uses were not mentioned in any reported incidents. Thirty persons had elevated blood-mercury levels in four residential events – 24 were exposed in a single event, in which schoolchildren found mercury in an alley and brought it into several homes[25].

The mercury exposure that poses the greatest risk to most Americans is ingestion of methylmercury in certain kinds of fish. Hair and blood mercury data from the 1999 National Health and Nutrition Examination Survey (NHANES) indicate that approximately 10% of women have mercury levels within one-tenth of the reference dose (0.1 µg methylmercury/kg body weight/day) for methylmercury. A reference dose is an estimate (with uncertainty spanning perhaps an order of magnitude) of the daily exposure of the human population to a potential hazard that is likely to be without risk of deleterious effects during a lifetime. Virtually all of the mercury was organic, indicating methylmercury exposure as the primary source[26].

2. HEALTH EFFECTS

Recently, ATSDR was asked by the EPA to provide consultation about the health effects from inhalation of elemental mercury vapor in the home. This chapter summarizes the scientific literature related specifically to home inhalation exposures to elemental mercury vapor. It should be noted that in some aspects there may be overlap with toxicity from exposures to other forms of mercury (e.g., methylmercury or mercuric chloride) or other routes of exposure (e.g., ingestion). However, a distinction must be made between the adverse health effects from these other forms and routes of exposure and those due to elemental mercury vapor inhalation. It is easier to recognize toxicity from an acute exposure to elemental mercury in the home, than from chronic exposures because of non-specific signs and symptoms associated with the latter. Therefore, this document gives more attention to chronic exposures.

2.1 How Does Elemental Mercury Get Into The Home?

Elemental mercury can get into the home in a number of ways. Children may be exposed to mercury vapors when they bring metallic mercury home to play with it. The heavy, shiny, silver liquid that forms little balls or beads when spilled fascinates children. Children may find elemental mercury when they trespass in abandoned warehouses, closed factories, or hazardous waste sites. Children also have taken elemental mercury from school chemistry and physics laboratories and abandoned warehouses[18].

Broken thermometers, thermostats and other mercury-containing instruments or equipment (e.g., fluorescent light bulbs, barometers, blood pressure measurement equipment, and light switches) used in the home, and stored mercury, are other sources of metallic mercury[18],[27]. Workers in industries that use metallic mercury have inadvertently brought mercury into their homes on contaminated work clothing and shoes or boots, exposing household members to the chemical[28].

Sometimes persons are exposed to mercury when attempting to extract gold from gold ore by heating it with metallic mercury,[29],[30] or when heating amalgam dental fillings to extract the silver [14],[31]. This practice is especially dangerous because heating mercury increases tremendously the amount of toxic vapor released[18].

Mercury may also get into the home as the result of folk traditions and spiritual practices (see Chapter 1).

Metallic mercury and its vapors can remain for months or years on furniture, carpet, floors, walls, and other such items, thus continuing to be a source of exposure[18]. Elemental mercury contamination can be removed from some items, such as clothing, by exposing them to outdoor air and sunshine.

2.2 Acute, High-Dose Effects

In acute (short-term, on the order of hours), high-dose (concentrations on the order of 10 mg/m³, or 10,000 µg/m³) exposure, mercury first affects the respiratory system and can result in pneumonitis, severe bronchiolitis, pulmonary edema, and death[32]. In a number of case reports of fatal

inhalation toxicity from mercury vapor, all were attributed to respiratory failure[18]. Central nervous system effects, renal damage, and inflammation of oral tissue can also occur[32].

2.3 Chronic, Low-Dose Effects

With smaller doses (on the order of 10–100 $\mu\text{g}/\text{m}^3$) over a longer period of time (years) neurologic effects predominate[32]. These may include intention tremors, which initially affect the muscles of the eyelids, tongue, and fingers[33] and sometimes spread to other parts of the body. Often this tremor can be demonstrated when an individual attempts to draw or write[34],[35]. Other effects include emotional lability, which is characterized by irritability, excessive shyness, confidence loss, and nervousness; insomnia; memory loss; neuromuscular changes (e.g., weakness, muscle atrophy, muscle twitching); headache; ataxia; polyneuropathy (e.g., numbness, exaggerated tendon reflexes, and slowing of nerve conduction); and deterioration of performance in tests of cognitive function. In some cases, hearing or visual field loss or hallucinations have occurred[18]. Because of their variability and non-specificity, these chronic neurologic effects may be misdiagnosed as behavioral or psychiatric disorders[35],[36]. Other chronic effects include excessive perspiration or salivation, kidney dysfunction, and corneal or lens opacities. Occasionally, exposure to mercury causes a syndrome called acrodynia, or pink disease. Acrodynia is an idiosyncratic, non-allergic hypersensitivity response caused by an exposure to mercury. It can result in severe leg cramps; irritability; and abnormal redness of the skin, followed by peeling of the hands, nose, and soles of the feet. Itching, swelling, fever, fast heart rate, elevated blood pressure, excessive salivation or sweating, rashes, fretfulness, sleeplessness, or weakness, or any combination of symptoms, may also be present. Acrodynia has been thought of as a disease of small children, but has occasionally been reported in older persons[18],[32],[37],[38].

2.4 How Much Mercury Is Dangerous?

There are case reports of clinical findings, such as those listed in the previous section, associated with exposure to mercury vapors resulting from broken clinical thermometers (which contain about 0.3 mL, or 0.06 teaspoons, of mercury[27]) or blood pressure measuring devices[39],[40],[41]. Overall, the amount of mercury contained in a thermometer is small and does not present an immediate threat to human health. However, to avoid a health risk over time, the mercury should be cleaned up and disposed of properly.

2.5 Pediatric Effects

The long-term health effects in children with elevated urine mercury levels have not been well studied. However, for any given overall household air concentration, children may be at higher risk for toxicity than adults. This is because mercury is heavier than air and becomes more concentrated near the floor, where children breathe[42]. Also, when compared to adults, pediatric respiratory air exchange per unit body weight (minute ventilation per kilogram) is greater, so given the same air concentration of mercury, one would expect a larger dose in the pediatric population[17],[18].

2.6 Mercury in Breast Milk

There is evidence of inorganic mercury secretion in breast milk[18].

2.7 Reproductive Effects

Empirical data on reproductive risks of mercury exposure are limited. A number of studies failed to show adverse effects on fertility in male workers with urine mercury levels as high as 8,572 µg/L [17]. On the other hand, a few studies suggest that an increased risk of spontaneous abortion might be present when either the mother or the father have been exposed to elemental mercury resulting in urine values as low as 50 µg/L [18]. Although both methyl mercury and elemental mercury have been implicated as a toxicant effecting unborn children, data on the effects of elemental mercury are limited and mainly based on a few case reports. Although most of these case reports do not demonstrate adverse effects on the fetus, not enough evidence exists to conclude that the fetus is not vulnerable to such exposures [18],[30],[43],[44].

2.8 Genetic and Cancer Risks

The evidence is inconclusive as to whether there are risks of chromosome abnormalities secondary to inhalation exposure to elemental mercury. To date, epidemiologic studies have not documented an increased risk of cancer from exposure to metallic mercury [18].

2.9 Biological Monitoring

Measurement of mercury in the urine is the most widely accepted method of monitoring for toxic levels of exposure and most closely reflects the body burden of the substance [45],[46],[47],[48],[49],[50],[51],[52], especially in chronic exposures [53]. However, for a number of reasons, interpretation of urine mercury levels is not always straightforward. A bimodal pattern of excretion has been described with a rapid initial phase (half-life of 2 days), followed by a slower phase (half-life of 70 days) [54]. Inter-individual variation has been observed in the time it takes to rid the body of mercury. In volunteers exposed to 10 to 15 minutes of mercury vapor inhalation, for example, elimination followed a single-phased excretion pattern that varied from 35 to 90 days [55]. Also, urine mercury levels vary depending on what time of day they are collected (e.g., the level is highest in the morning [56],[57],[58]). Furthermore, the level of urine mercury at which an individual will manifest signs and symptoms of toxicity varies [59],[60],[61],[62]. Finally, urine levels may not adequately reflect mercury levels in the mammalian brain, and concentrations in various regions of the brain may differ [63],[64]. Although estimates of brain mercury half-life elimination rates in some studies of metallic mercury vapor exposure are as short as 21 days for a brief exposure, one case report found mercury persisting in brain tissue 10 years after cessation of known exposure [65].

Numerous studies have been conducted to ascertain how high the level of urine mercury accumulated must be before adverse health effects occur from chronic low-dose exposures. These studies focused primarily on the central nervous system, which is the target organ system most sensitive to this type of exposure. Effects on the kidney have also been reported, but generally at higher doses than those that result in neurologic toxicity [63].

These studies provided useful evidence linking chronic, low-dose mercury exposure to adverse health effects. However, they provide less guidance in interpreting what urinary mercury levels mean in any particular individual. Some papers report mean (or median) group values of urine mercury levels associated with renal and neurologic and neurobehavioral abnormalities without reporting the standard deviations [66],[67],[68],[69],[70],[71],[72],[73],[74],[75]. In others, the

lower 95% confidence interval calculated from the reported standard deviations are below zero, suggesting a non-normal distribution[76],[77],[78],[79]. When the distribution of urine mercury values does not correspond to a normal (bell-shaped) curve, it is hard to interpret what a person's urine level means with regard to health risk. Many of the reported standard deviations are large, indicating substantial inter-individual variations[77],[78],[79],[80],[81],[82]. No papers could be found that reported the sensitivity (i.e., the probability of the test being positive if disease is present), specificity (i.e., the probability of a test being negative if disease is absent), predictive value positive (i.e., the probability of disease if the test is abnormal), or predictive value negative (i.e., the probability of being disease-free if the test is normal) of urine mercury tests in an individual[83]. Knowledge of these probabilities is necessary if the urine mercury level is going to be of any practical value in guiding health care interventions in any given individual patient.

Some guidance is provided to the clinician by data collected on urine mercury levels in reportedly unexposed subjects. Goldwater reported urine mercury levels from 1,107 participants in a non-randomized multinational sample of persons without a known history of mercury exposure[84]. He found that urine mercury levels as follows:

- <0.5 µg/L in 78%
- <5 µg/L in 86%
- <10 µg/L in 89%
- <15 µg/L in 94%
- <20 µg/L in 95%
- <25 µg/L in 96%
- 25 – 50 µg/L in 1.9% and
- >50 µg/L in 1.5%

The highest urine mercury level found was 221 µg/L.

The author points out that the study used convenience sampling, and participants were not picked randomly. The currently accepted upper normal value for urine mercury is based on the level found in 95% of the unexposed population, i.e., 20 µg/L[85]. Although a number of studies have found adverse neurotoxic effects at higher urinary mercury levels[59],[66, 67, 68, 69, 70, 71, 72, 73],[86],[87],[88]the lowest mean chronic urinary mercury levels at which adverse health effects have been demonstrated in humans are close to the upper background value of 20 µg/L. Many of these studies reported on very subtle signs of toxicity that required sophisticated instrumentation to detect and which would not generally show up on a clinical neurologic exam. Piikivi and Hanninen[81]studied workers exposed to mercury who had mean urine levels of 10.1 µmol/mol (standard deviation (SD) 6.8, range 1.9 – 31.2) and controls with mean levels of 1.2 (SD 0.9, range <0.6 – 3.8). These values correspond to 17.9 µg/g (SD 12.0, range 3.4 – 55.2) and 2.1 µg/g (SD 1.6, range <1.1 – 6.7)[42]. Exposed workers showed significantly more sleep problems and higher mood scale values for anger, fatigue, and confusion compared with controls. No significant decrements in psychomotor tests or memory and learning were found in exposed persons. Echeverria et al.[77]studied exposed dentists with spot urine mercury levels >19 µg/L (compared with unexposed controls having no detectable mercury in urine) and found decrements in tests of neurobehavioral function. The mean urine

mercury level in the exposed group was 36 µg/L, but with a large SD of 20 µg/L. Fawer et al. [89] found increased hand tremor in exposed subjects with a mean urine mercury level of 11.3 µmol/mol creatinine and SD of 1.2 µmol/mol. This corresponds to a mean and SD of 20 µg/g creatinine and 2.1 µg/g, respectively[42]. Chapman et al. found changes in tremor in exposed workers with mean levels of 23.1 µg/L (SD of 28.3 µg/L)[78].

Several studies have been published on adverse renal effects as they relate to urinary mercury levels, and these effects seem to occur at higher mercury levels than those that cause neurobehavioral effects. Naleway et al. studied dentists with urine mercury levels of 0 – 115 µg/g creatinine and found no relationship between the mercury levels and serum creatinine, creatinine clearance, serum β -2-microglobulin (B2M), or urine B2M[75]. Boogaard et al. compared high exposure (mean 23.7 µg/g creatinine, range 3.5 – 71.9), low exposure (mean 4.1 µg/g, range 0.6 – 8.8), and non-exposed controls (mean 2.4 µg/g, range 0.5 – 6.8)[74]. No standard deviations were reported. Although B2M and N-acetyl- β -D-glucosaminidase were higher in the groups with high exposure when compared with the low-exposure groups, both were within the 95% confidence interval of the levels found in the unexposed control groups. Buchet et al. did not find an increase in urinary albumin, transferrin, orosomucoid, B2M, alkaline phosphatase, or plasma creatinine in those persons with mercury levels <50 µg/g[81]. The authors also reported an increase in β -galactosidase in those with urine mercury levels of 5 – 49.9 µg/g, but the authors also indicated that the health consequences of this finding were unknown. Roels et al. reported that increased excretion of urinary proteins was seen at a mean urinary mercury level of 95.5 µg/g (range 9.9 – 286.0, 5% level of 12.3, 95% level of 245.4)[69]. However, urine levels of amino acids, B2M, retinol binding protein, and albumin were not significantly elevated compared with controls.

A number of papers have reported on urine mercury levels at which neurologic symptoms are more likely to be found on a routine neurologic examination. Some found that symptoms and signs were not apparent in the patient's medical history or on the physical exam until urine mercury levels were in the 50 – 100 µg/L or µg/g creatinine range[18],[90],[91]. In other studies, this occurred at 102 – 162 µg/L or µg/g[47],[92],[93],[94] 200 – 450 µg/L or µg/g[95],[43],[59],[71],[72],[93],[95] or even as high as about 1,000 µg/L[90],[96].

2.10 Treatment

The comments of Campbell et al., epitomize the dilemmas faced by clinicians treating patients exposed to elemental mercury[97]. Although case studies might applaud specific treatment modalities, there is a paucity of empirical data on how these treatment alternatives affect outcome. The result is an absence of evidence-based treatment decision guidelines. In particular, there is little to help the physician identify patients with a good prognosis who may avoid unnecessary therapy.

Chelation has been touted not only as a treatment[98],[99],[100], but as method of diagnosis as well [101],[102],[103],[104]. The safety and efficacy of chelation for diagnostic purposes is unproven [105],[106]. Some authors have reported the recommendation that all individuals who have specified blood or urine mercury levels or who are symptomatic should undergo chelation[90],[98]. Unfortunately, little empirical evidence exists to justify these blood or urine levels as an indicator for chelation. Furthermore, many of the clinical signs and symptoms of mercury toxicity are

nonspecific (e.g., forgetfulness, headache, irritability, emotional lability, insomnia, inability to concentrate, nervousness, anxiety, dizziness, nightmares, excessive shyness, violent behavior, decreased appetite, weight loss)[85],[107],[108]. These findings may overlap with signs and symptoms due to nontoxic psychiatric disorders, thus leading to a misdiagnosis[36],[97],[109]. The rarity of mercury toxicity[94] may also make it less likely to be high on the list of conditions a clinician would typically consider. Intention tremor is probably one of the least ambiguous findings related to metallic mercury exposure[108]. Although some authors recommend monitoring urine mercury levels to assess the efficacy of chelation, the urine levels that should guide the initiation or cessation of treatment are not clearly documented[98].

There are few controlled, systematically collected data on how chelation effects the outcome of elemental mercury toxicity. The results from the case-study design reports completed are hard to interpret [29],[94],[97],[110],[111],[112],[113],[114],[115],[116],[117]. A number of investigators have noted increased urinary excretion of mercury after the administration of chelators [31],[85],[90],[104],[106],[111],[116],[118],[119],[120],[121],[122]. However, evidence is lacking to show that the outcome is better for those who are chelated versus those merely removed from exposure [34],[35],[36],[85],[91],[101],[102],[122],[123],[124],[125]. It is possible that this occurs because chelation mobilizes only a small proportion of the total body burden of mercury or because it mobilizes mercury in the kidney tissue, but not in the brain[126]. Because some cases of mercury toxicity will abate with simple removal from exposure,[33],[107],[127]it is difficult to assess the effects of chelation therapy without doing controlled studies. In a review article, Kosnett was only able to find one study that addressed this issue[128]. This study involved 86 patients treated with the chelator, dimercaprol (BAL) within 4 hours of ingesting >1g of mercuric chloride. Although the study showed improved survival when compared to historic controls, its relevance to patients with longer term exposure to elemental mercury is unclear.

Some have expressed concern that chelators, by mobilizing mercury from other tissue stores, may enhance brain levels and worsen toxicity[37],[101],[129]. The potential for adverse consequences when chelation therapy is used is an issue in treatment decisions. For example, approximately 50% of patients treated with BAL experience adverse drug reactions. Doses >5 mg/kg may result in vomiting, seizures, stupor, and coma[103].

3. HISTORY OF ACTION AT FEDERAL, STATE, AND LOCAL AGENCIES

3.1 EPA

EPA first took up this issue in 1992, when the California Department of Health and Human Services investigated a complaint, lodged by Dr. Wendroff, related to the sale of elemental mercury in folk pharmacies or *botanicas* in the Los Angeles area. The EPA's Office of Enforcement took up the matter for consideration under section 7 of the Toxic Substances Control Act (TSCA)[130]. In January 1993, the Office of Pollution Prevention and Toxics (OPPT) conducted a risk assessment to determine whether these uses of mercury constituted an "imminent hazard to human health."

OPPT noted that "many uncertainties still exist regarding the extent and conditions of use of mercury in these practices" but offered two scenarios as "bounding estimates" of exposure. Acute exposures were found to be of low to moderate concern, but chronic exposures were found to be of high concern. Three risk-management options were considered: risk communication in a public outreach campaign, product stewardship to prevent distribution of mercury to *botanicas*, and regulatory action under TSCA. Product stewardship was deemed ineffective because there are many legal sources of mercury; regulatory action was deemed resource-intensive, difficult to implement and enforce, and a potential infringement of religious freedoms protected by the First Amendment[11].

EPA engaged several national Latino organizations for help implementing a public outreach strategy. The organizations had the following suggestions[11]:

- EPA should carefully identify the target population because mercury use is more likely to be limited to specific communities and not likely to be widespread.
- A risk communication program should be established, with the help of Latino organizations; the program should be framed as general mercury education with no mention of religion.
- Other interventions such as preventing suppliers' sales of mercury to *botanicas* would likely be ineffective, drive the problem underground, and erode the already low level of trust the community has in government agencies.
- EPA should have an ongoing dialogue on other environmental and public health problems of concern to Latinos, including pesticide exposures to farm workers, environmental justice analysis of Toxic Release Inventory (TRI) data, and cross-border disposal problems along the Rio Grande.

In September 1994, the EPA launched an informational campaign, including a two-page mercury alert and a four-page technical fact sheet to be used as a resource for other groups contacted about mercury uses. The fact sheet was produced in English, Spanish, and Portuguese (Appendix A). EPA sent outreach materials developed by California and Connecticut (Appendix A) to state Departments of Health and Environment, flagging this issue for them. States were asked to provide EPA with both the names of community groups who could help in getting the message out, and a list of contacts who could provide assistance with health or clean-up issues.

As part of this outreach effort, EPA developed and aired a series of radio broadcasts on the subject. Broadcasts were written, translated and recorded by the Hispanic Radio Network, Inc. as part of a

regularly scheduled daily program called “The Best of All Worlds,” which dealt with environmental and health issues. The broadcasts consisted of five segments that discussed the uses of mercury, potential substitutes, dangers to health, diagnosis and treatment, and cleanup of contaminated homes. The segments aired on five consecutive days in September 1994 on all the Spanish language stations that are members of the Hispanic Radio Network across the United States. Segments were prepared and delivered by the show’s host, Reverie de Escobedo.

In addition to the outreach effort, the Chemical Control Division in the Office of Prevention Pesticides and Toxic Substances sent a letter to mercury producers, importers, and recyclers, informing them of the hazards involved in downstream uses of mercury and encouraging them to implement product stewardship measures to ensure that labeling and other safety information distributed with their products are supplied to downstream users. In particular, recipients of the letter were asked to work with mercury distributors to ensure that they are taking appropriate steps to ensure that consumers are made aware of the hazards of mercury.

In response to several poisoning incidents involving school students in 1994, EPA’s Office of Emergency and Remedial Response (OERR) developed and distributed a pamphlet and video directed toward children about the dangers of playing with mercury (Appendix A).

In 1997, EPA issued a joint alert with ATSDR about continuing patterns of mercury exposure, reporting several incidents from 1994–1997 involving mercury poisoning in schoolchildren, and warning of the potential for similar incidents occurring from spiritual and folk traditional uses, although no such incidents had been reported. The alert was released in English, Spanish and Haitian Creole[131]. This was part of an agency-wide mercury outreach strategy, that included a conference on pollution prevention, use reduction and disposal, an outreach project to science teachers nationally, and a mercury spill fact sheet, as well as an intra-agency task force that developed an EPA Action Plan for mercury.

In November 1998, Dr. Wendroff contacted the Community Involvement and Outreach Center (CIOC) in EPA’s OERR with a concern about what he believed to be a large number of contaminated homes soon to be discovered. Because of the potential for releases to the environment, the issue was taken up by OERR to review the extent and severity of the problem. After conducting initial background research and identifying previous work done by states and OPPT, a multi-agency task force was established to assess the problem. The Task Force included representatives from EPA; ATSDR; Consumer Product Safety Commission (CPSC); and state, county, and city health departments. Private citizens representing academia and community groups were also invited to join. Task Force conference calls began in January 1999.

In 1998, EPA Region 5 gave approximately \$20,000 in a grant to both the Illinois State Health Department and the Chicago Health Department, to obtain measurements of mercury levels in residences where spiritual and folk traditional practices occur. Because access to homes has proven exceedingly difficult to obtain, this research is ongoing. EPA Region 2 similarly gave a \$20,000 Environmental Justice grant to the Puerto Rican Family Institute (PRFI) (originally in conjunction with Dr. Wendroff) to gather information from community members in New York City

about the use of mercury for spiritual practices. A short questionnaire was developed and given to subjects who visited PRFI; there was a low reported familiarity with mercury use in religious practices. PRFI also developed pamphlets in English and Spanish (Appendix A) addressing elemental mercury poisoning from spiritual uses. A 1998 Environmental Justice/Pollution Prevention Grant was awarded by EPA Region 2 for more than \$82,000 to Clyde Johnson (principal investigator [PI]) and Arnold Wendroff (co-PI), to investigate mercury sales in Brooklyn, and to obtain residential measurements of mercury vapor concentrations.

3.2 ATSDR

ATSDR and EPA issued a joint alert in 1997 on “continuing patterns of metallic mercury exposure,” including incidents involving (a) schoolchildren who were exposed to high levels of mercury at school and elsewhere, and (b) religious uses of mercury[131].

In 1999, ATSDR prepared a draft framework for “public health response to ritualistic use of elemental mercury”[132]. A four-part framework was proposed, consisting of outreach, education, environmental and clinical response, and capacity building for partnerships with state, district, and local health departments. Many of that report’s recommendations have been discussed by the Task Force and are incorporated here.

3.3 Consumer Product Safety Commission

The CPSC is empowered to oversee the labeling of hazardous substances in consumer products under the Federal Hazardous Substances Act (FHSA)[133]. A label similar to the following is required for mercury, in addition to information identifying the name and location of the manufacturer:

Front: WARNING: VAPOR HARMFUL. HARMFUL IF SWALLOWED. See additional cautions on (side/back) panel.

Side/Back: Contains mercury. Mercury vapors are toxic. Do not apply heat to the mercury. Avoid opening or spilling it. If spills occur, push the mercury onto paper, put it in a closed container, and discard it in the trash. DO NOT sweep or vacuum. Do not burn the mercury or throw it down the drain. Wash hands thoroughly after handling. If swallowed, DO NOT INDUCE VOMITING. Immediately call a physician or Poison Control Center for first aid instructions. Keep out of the reach of children[134].

Even if properly labeled, the sale of mercury for household use is not recommended by the CPSC.

The CPSC has overseen compliance with mercury labeling requirements. It has issued Consumer Safety Alerts[135] and distributed them specifically among populations of potential mercury users. It has warned large suppliers that mercury may not be distributed for resale to consumers unless properly labeled, and provided a sample warning label to pass on to any retailers who may purchase mercury from them for resale.

The CPSC also acted with the cooperation of a distributor in a 1995 voluntary recall of mercury necklaces imported from Mexico, which consisted of a small glass ball or vial filled with mercury on a leather or beaded chain[136].

3.4 California

The California Department of Health Services issued a public warning about the personal use of mercury in January 1994, after the Los Angeles County Department of Health Services investigated the sale of mercury in the Los Angeles area[137].

3.5 New York State

New York State Department of Public Health conducted a study in the mid 1990s of mercury in Chinese folk medicines, in which laboratory analysis revealed high concentrations of mercury, arsenic, and lead in certain medicinal products. Some medicines, if administered at the recommended doses, could result in doses of mercury that exceeded those associated with nervous system effects in humans. The Food and Drug Administration was contacted about these medicines in 1996[138].

3.6 New York City

New York City Health Department of Health and Mental Hygiene has been responding to mercury uses in religious and folk practices since 1991, including outreach with fact sheets, brochures, posters and press releases, as well as working with *botanica* owners in all five boroughs. The department developed and distributed a clinician's brochure to 4,000 licensed New York City pediatricians, family practitioners, and obstetricians/gynecologists; they also developed and distributed a general brochure to *botanicas* for the public in English, Spanish, and Haitian Creole. The department subsequently sent a letter to *botanicas* for which addresses were available, explaining the labeling requirements for mercury, and inspectors conducted follow-up visits. This activity may have caused mercury sales to go underground in New York and northern New Jersey[4], (Redmond P. U.S. Environmental Protection Agency. Personal communication with Eric Canales, New York Academy of Medicine, February 15, 2001.).

Early results from the follow-up visits included some air measurements taken with a Jerome instrument. No measurements taken inside the *botanicas* exceeded any occupational exposure limits (the highest was 20 – 22 $\mu\text{g}/\text{m}^3$). However, these levels would be of serious concern if a *botanica* were in a multi-use space that someone used as a residence, in addition to (or adjoining) a commercial space. Due to these concerns 11 *botanicas* that were identified during the initial surveys as sharing the building with a residence were sampled. A Lumex RA-915 was the instrument used for all of these inspections. Five of the 11 *botanicas* sampled evinced levels above 1 $\mu\text{g}/\text{m}^3$ in a breathing zone (range 1 – 8 $\mu\text{g}/\text{m}^3$). As a result of these findings, residential common areas and or apartments, and in one case a business, were sampled in each instance. None of samples collected in these residential areas, including samples collected outside of occupant breathing zones, e.g., riser penetrations at floor level) exceeded 1 $\mu\text{g}/\text{m}^3$.

3.7 Connecticut

The Connecticut Department of Public Health conducted a study[12]described elsewhere in this report in collaboration with the Hispanic Health Council. The state's implementation plan to address cultural and religious mercury use provided for the distribution of bilingual/bicultural materials

where *azogue* is sold, including in *botanicas* and working sites of folk medical practitioners. A comprehensive brochure (Appendix A) was developed by the Hispanic Health Council, and published and distributed for outreach in 1993, with one version for medical professionals and mercury suppliers and another for the general public. Commercial establishments selling mercury were asked to provide an educational brochure to each mercury customer, as well as display a visible poster describing the health hazards of *azogue*. The biggest challenges Connecticut encountered were limited resources and community resistance.

Additionally, information on mercury was distributed at thermometer points of purchase, and a series of radio interviews on Spanish language stations were aired. Press releases were designed, and stories were carried in several Spanish language newspapers as well as on the front page of the *Hartford Courant* (Toal B. Connecticut Department of Health. Personal communication, August 2, 2001.).

Connecticut is updating its fact sheet and reinvigorating its efforts for community education, including a plan to branch out to other cities in Connecticut with Latino populations (e.g., Bridgeport, Waterbury, New Haven).

3.8 Chicago/Illinois

The findings of the Chicago Department of Public Health's 1997 study[3] are described elsewhere in this document. The Illinois Department of Health, Division of Environmental Health was given EPA funding in 1998 to determine mercury levels in air as a result of cultural and religious mercury use, to determine which uses result in the greatest exposures, and to determine whether cultural and religious uses of mercury constitute a public health hazard.

Both agencies are hopeful that mercury use has decreased, as a September investigation by the *Chicago Sun Times* found only 1 of 15 *botanicas* reported continuing sales of mercury[5]. However, it is possible that the reporter could not gain access to mercury because the sales have simply gone underground.

3.9 Oregon

In April 2001, the Oregon Department of Human Services, Health Division issued a health alert about mercury necklaces imported from Mexico and worn by children in schools. The necklaces have mercury and sometimes a brightly colored liquid contained in a hollow glass pendant on a leather cord or beaded chain. Pendants come in shapes including hearts, bottles, chili peppers, and saber teeth. When school students bring them into the classroom, they can break, causing spills [139].

The alert provided information about the necklaces and their risks, the health effects of mercury vapor, and information on spill prevention and response in schools. The alert was distributed via the World Wide Web and submitted to the Oregon Department of Education for distribution to schools.

3.10 Puerto Rico

Under a 1973 Puerto Rican law amended in 1987, hazardous products may not be sold to the public without written labels, and the sale of certain hazardous substances is prohibited altogether. On January 15, 1991, in response to a complaint from Dr. Wendroff, an inspector from the Department of Health in Puerto Rico visited a *botanica* and purchased mercury. In a May 1991 order, the sale of mercury in *botanicas* was found to constitute a danger to the consumer and to the community, in violation of the hazardous substances law. The Mardo Distributing Corporation, which was a mercury supplier to industries in Puerto Rico and the Virgin Islands, was prohibited from packaging mercury in small vials for sale to consumers[140].

4. SUMMARY OF TASK FORCE ACTIVITIES

4.1 Plenary Conference Calls

Task force members participated in regular plenary conference calls (Appendix C). The group organized itself into three subcommittees, which held additional calls to conduct their business regarding clinical research, environmental monitoring, and community outreach. Plenary calls served as a forum for sharing information, discussing the results of subcommittee work, and raising for consideration a wide range of policy options for addressing this issue (Chapter 5).

The Task Force decided to host a forum as a vehicle to hear from experts on this issue. Because many of the researchers involved with cultural and religious mercury use had been active task force participants, and had already shared much of their knowledge with the task force, it was decided that the most beneficial use of the time at the forum would be to focus more narrowly on listening to religious practitioner and community outreach experts.

4.2 Activities of the Clinical Research Subcommittee

The clinical research subcommittee reviewed the literature on elemental mercury exposure and health effects, shared information about ongoing research, and identified research needs. This work is reported in Chapters 1 and 2, and Sections 5.2 and 6.2.

4.3 Activities of the Environmental Monitoring Subcommittee

The Environmental Monitoring Subcommittee discussed available measurement technologies for elemental mercury in indoor air, and typical action levels used in different situations by regulatory agencies. The subcommittee reviewed sample protocols for the investigation and response of mercury spills. The work of the committee is reported in Sections 1.5 and 6.3.

4.4 Activities of the Community Outreach Subcommittee

The Community Outreach Subcommittee shared information about ongoing outreach activities and resources (Appendix A has sample resources), barriers to community involvement, and strategies for involving the community in outreach efforts. Much of this information can be found throughout this report, especially in Chapter 3 and Sections 5.1 and 6.1.

To receive input directly from community members on outreach strategies, representatives of the task force began a series of interviews in fall 2000 with community, religious, and public health leaders in the Washington metropolitan area. The persons interviewed were representative of communities that may be exposed to mercury through a number of routes, including through religious ceremonies and practices.

The task force requested interviews from 19 individuals and/or organizations that work extensively with communities of Latin and Caribbean origin. Of these, a total of six interviews were granted and conducted by members of the task force (Appendix D). Through these interviews, the task force hoped to gain a better understanding of the ways in which mercury is used, the cultural sensitivities surrounding such practices, and opportunities to reduce risks and exposures in the community from all home sources of mercury exposure.

Those persons interviewed were asked a series of questions, depending on their organization's purpose. The interviewees were educated on the activities of the task force as well as its mission in conducting the interviews. After each interview, interviewees were asked to participate in the task force forum in May 2001. Although not all were available to attend, each interviewee shared with task force representatives salient points that should be addressed in such a forum. The complete results and recommended actions from each interview are presented in Appendix D.

The salient points gathered from the interviews are summarized below:

- Overall, there is a lack of information regarding the impact of mercury's use in communities.
- The majority of organizations interviewed had limited involvement with this issue and were unaware of any reported incidents of cultural and spiritual mercury exposures. Most had little if any direct experience with spiritual and folk traditions that incorporate mercury use.
- Most reported that mercury use is not widespread throughout Latino and Caribbean communities. Some suggested that it may be much easier to obtain mercury in the United States than in home countries.
- It is believed that most consumers from these communities are unaware of mercury's adverse health effects.
- In some traditions, the physical nature of the metal is believed to enhance a spell's effectiveness.
- The regulation of mercury would not necessarily cease the supply and demand, but just intensify this issue by causing the sale of mercury to go underground.
- Embracing the broader issue of mercury exposure as a whole is the most effective means for educating the public.
- All organizations interviewed expressed a willingness to assist the task force in either data acquisition or education and outreach efforts.

Respondents offered the following suggestions for addressing the problem:

- Focus outreach more broadly than just on Latino and Caribbean communities who engage in cultural or religious practices; a more general approach will be better received and reach a wider audience.
- Capitalize on previous experience with HIV/AIDS education when developing potential education and outreach strategies; previous experience, may be useful in surmounting barriers associated with cultural taboos and a reluctance to speak about private or personal practices.
- Examine all domestic routes of exposure involving mercury and plan a "best approach" for addressing them.
- Gather clinical data from experimental and hospital studies regarding exposure levels of mercury and its effects.
- Conduct a wide reaching campaign that encompasses the hazards of mercury in general by developing educational videos and national publications in Spanish.
- Seek expertise of anthropologists familiar with cultural practices affecting health care.
- Engage religious leaders that represent many area religions in outreach and education; lay persons may be more inclined to heed warnings of the hazards associated with cultural and religious mercury use if it comes from a trusted community figure.

4.5 Forum on Ritualistic Uses of Mercury

The Forum on Ritualistic Uses of Mercury was held May 14 -15, 2001, in Arlington, Virginia. The task force convened the discussion forum to understand better the cultural and religious components of this environmental and public health issue. Approximately 40 people participated in the forum, including cultural and religious practitioners; environmental, public health, and community advocates; government officials; and academicians.

4.5.1 Desired Outcomes

Three desired outcomes for the forum, guided the planning and structure for the 1.5 day event:

- **Task force members and other forum participants will understand the origins, scope, and complexities associated with cultural and religious uses of mercury.** A panel of four faith practitioners was invited to the forum to provide insight into the beliefs and practices of their respective traditions, and to educate participants about how mercury is and is not used within that tradition.
- **Participants will help develop outreach strategies that incorporate the perspectives of community members and health educators who work effectively with Latino and Caribbean communities.** A panel of community health education experts was assembled to provide best practices and lessons learned for conducting cross-cultural outreach and education, and to help develop innovative means for building support from a variety of community organizations and institutions.
- **Participants will provide input to the task force activities report.** A draft form of this report was distributed to participants before the forum, and participants were asked to comment on the entire report. Break-out sessions were designed specifically to discuss and revise report recommendations (Chapter 6).

4.5.2 Participant Expectations

The expectations of forum participants were also solicited before the meeting, to plan a more productive event and to assist in evaluation of the forum on its conclusion. The three main themes culled from the responses were:

- **Listen and understand** – particularly regarding the context, meaning, and specific practices of cultural and religious mercury use.
- **Network** – connect with others involved in reducing mercury exposures in communities, and forge ties that would help participants work together productively in the future.
- **Action** – setting a clear direction for research, and actively involving community members in risk assessment, outreach, and education.

4.5.3 Facilitation and Evaluation

In an effort to ensure all voices were heard and the stated objectives were met, a skilled facilitator experienced in cross-cultural issues moderated the forum proceedings, assisted by a team of

facilitators who moderated the break-out sessions. The end-of-forum evaluations indicated that expectations were met and the vast majority of participants felt it was a success.

4.5.4 Panel 1: Religious Practitioners

In the first panel, representatives from Santería, Palo Mayombe, and Voodoo shared their experiences and beliefs with forum participants, providing background on their faith tradition and the ways that mercury is and is not incorporated into its practices. Major points that emerged from the first panel session include the following:

1. **The community is diverse.** Numerous faiths within faiths exist in Latino and Caribbean communities. Knowledge of and involvement in specific religious practices vary from region to region. In some cases, mercury is central to religious belief or practice; in other cases it has a more general cultural context. Mercury is used in a variety of manners and contexts, posing different levels of risk to the user.
2. **It is important to get the real story.** Many African diaspora religions have been misrepresented and endured a great deal of persecution. Academia alone does not present a complete and accurate picture, nor do many popular mass-market books; ordained practitioners, recognized elders, and other community figures are untapped sources of information on cultural uses of mercury.
3. **Mercury is available.** Mercury is easily obtained and readily available to those who wish to use it, and most of the people who buy mercury for cultural and religious purposes are recent immigrants to the United States. Much of its sale and distribution is unregulated and operates underground.
4. **Put mercury use in context.** The lack of access to the modern American health care system in many minority and immigrant communities has prompted many to employ traditional folk remedies, some of which include mercury. For these users, mercury is often used repetitively until the underlying problem is resolved. Many of those who use mercury are not aware of its toxicity, or that breathing the vapors creates the highest exposures.
5. **Tips for education and outreach.** Education should be focused across the board to a wide range of cultural and religious groups. Focusing on only a few traditions will be counterproductive. Other religions, such as Hinduism, also use mercury, but are largely overlooked in research, education, and outreach efforts. Providing people with information will result in behavioral changes that reduce exposure. Alternatives to mercury exist, and it is important to be sure they are in fact safer than mercury.

4.5.5 Panel 2: Health Educators

The second panel was comprised of Latino and Caribbean health educators and other health educators who serve Latino and Caribbean populations. Major points that emerged include the following:

1. **Use peer education with people who will be respected by the community.** Some community members might be suspicious of outsiders. Peers and respected religious leaders in the

community will be best received, but sometimes community and religious leaders will be reluctant to get involved if they stand to lose the trust of their community

2. **Use effective ways of reaching people**, including frequenting local businesses such as beauty salons and laundromats; hosting events with free food and an educational program; and using Spanish language print, radio, and television avenues. Get to know the community so you can include local businesses and community organizations. Be aware of political issues among community groups to ensure that working with one group will not hinder your relationship with another.
3. **Put the issue in the proper perspective.** A number of pressing health issues in Latino and Caribbean communities require attention. When resources have to be allotted to so many other health issues, it is important to put cultural and religious mercury use in proper perspective.
4. **Determine what needs to be followed through.** Be sure you have a plan for referring people in need of further medical attention, and that culturally sensitive and multilingual staff are available to handle inquiries, including addressing health insurance issues.
5. **Know your audience.** Focus groups are an effective way to involve the audience population and identify the most effective messages. Messages must be clear and practical. Try to understand mercury use from the user's perspective; they are rational decision makers, and mercury use makes sense based on their information and context. Materials must reflect knowledge of the audience in format, design, and literacy level. Using language that indicates appropriate cultural context (for example, Lukumi words when discussing Santería) is helpful.

Summaries from the panel sessions are provided in Appendix B.

4.5.6 Breakout Sessions

Breakout sessions focused on report recommendations (Chapter 6) and on conducting community outreach and education activities. The following ideas emerged as suggestions for local health departments and community-based organizations engaged in planning outreach programs.

1. Know Your Audience

- a. **Focus groups are not only necessary for outreach, they are fundamental.** However, it is difficult to recruit participants for such a sensitive topic. Money is a possible incentive to attract participants; assure them that the discussion will remain general. Another suggestion is to have an involved person (possibly a practitioner) lead the focus groups. Focus groups should be conducted for practitioners, sales people, and lay people as well.
 - i. **Research should be conducted to better know the audience.** Depending on available funding, this could include focus groups and marketing research.
- b. **Some suggestions from forum participants for reaching the audience:**
 - i. **Provide information in a sensitive manner.** To be effective programs must present information to the targeted audience in a sensitive manner.

- ii. **It is unrealistic to expect an immediate cessation of mercury sales or usage.** Successfully educating the community and subsequently reducing mercury exposures will be predicated on a cultural transformation that will not occur overnight.
- iii. **Remember that there are conflicting messages about the safety of mercury.** Mercury is still used in school laboratories, dental work, and thermometers. Such use fosters the perception that mercury is a benign substance.

2. Follow through

- a. A long-term support network will be needed to handle referrals and inquiries resulting from the educational outreach. The support network may include a hotline, perhaps at the state level, that is manned by individuals who are multilingual and culturally sensitive. The support network should also include a plan for referring individuals to health care providers that will receive them regardless of immigration status, insurance coverage, or income.

3. Evaluate!

- a. All groups undertaking outreach activities should evaluate the effectiveness of the outreach effort, which is critical to measuring success and determining future directions for educational efforts. Quantitative and qualitative evaluation methods will measure process, outcomes and impacts, including changes in awareness, knowledge, attitudes, and behaviors (Appendix E).

Specific Recommendations for different Outreach channels:

1. Media

- **The right media outlet needs to be targeted for specific cultures.** Research should be done on which communication medium will penetrate the target community (radio, television, or newspaper). It was suggested that radio programs are popular within minority communities.
- **Identify media channels to target local communities.** Local TV, radio, and newspapers that target specific communities should be used where possible. Mainstream media may also be used to reach community youth.
- **Develop/use posters and brochures to get the message out.** Train, subway, and bus stations were suggested as appropriate areas for placing posters in targeted community areas. Ensure that materials developed target the community that should be reached and the materials are interesting and colorful.
- **Use public service announcement videos to target specific audiences.** There was general consensus that developing public service announcement (PSA) video tapes explaining what mercury is and its resulting health effects would be an effective

means of getting the word out on mercury. Such spots are run in health clinic waiting rooms and on closed circuit hospital channels.

- **Use radio/television spots.** Television and radio spots were suggested as a good means of reaching less disfranchised groups. Showing informational spots during prime viewing hours, such as during soap operas, was noted to be particularly effective.

2. Social Networks

- **Take advantage of mandatory meetings between community-based organizations and other large associations with similar programs.** Many community-based organizations take part in mandatory meetings with other organizations/associations with similar goals (e.g., state and local health departments). Participants suggested that community-based organizations take advantage of the captive audience at these events to share information and network on mercury exposure issues.
- **Provide free breakfast/lunch programs to gather community members for informational meetings.** The National Alliance for Hispanic Health (NAHH) has found such programs to be successful in bringing in a targeted group, such as mothers with children in the Headstart program, to provide them information on a given topic.
- **Expand the pilot “Amnesty Day” in Florida that provides for safe disposal of household mercury.** “Amnesty Day” is a pilot program sponsored by the state of Florida in which the state disposes of mercury in households at no cost.
- **Distribute educational materials in centrally located community businesses.** Beauty parlors, laundromats, legal aid societies, hospital community centers, and food distribution centers are regularly visited and could provide educational information to the public.
- **Target multi-cultural events.** Deliver messages at sporting events, community fairs, parades, celebrations of different national holidays, and generally any gathering points.
- **Peer Education.** This could include establishing relationships with different organizations and relying on peers to spread the messages by word of mouth, presenting information to local civic organizations, answering health-related questions and concerns at community coordination centers/ public availability sessions or providing training and materials for persons responding to community questions and concerns.

3. Religious Groups

- **Identify the religious organizations that are willing to share mercury health education nationwide.**
- **Identify the key religious people in the community.** These religious leaders may know how to get through to the community in ways that other people would not, in addition to providing insight into outreach materials for the community.
- **Religious groups must be researched to see how allied the groups are between cities.** This research should also encompass cultural considerations that may vary among various regions.
- **Conduct outreach through *botanicas* that emphasizes alternatives to mercury.** Mercury does not need to be used in Santería spells, but mercury makes the spells stronger. A higher level practitioner can do the work to get a more powerful spell. It is more expensive but is an alternative to using mercury.
- **Remember it is not illegal to use mercury. Do not persecute individuals for doing so.** Some people will not stop using mercury, and they have a religious right to use it if they choose.

4. Schools

- **Educate the teachers so that they may in turn educate the children.** This recommendation may include the idea of distributing a one-page alert for children to take home to their parents, possibly piggy-backing ATSDR's one page lead alert. Materials such as comic books that illustrate the dangers of mercury were suggested as possible educational tools.
- **Use school health programs.** Through discussion, the group recognized that certain segments of the population would not be reached through many of the traditional outreach methods. The group suggested that school health programs would be helpful in such cases to reach the children of these communities.
- **Recruit college students to visit schools.** Local environmental college students could come to the schools and speak with the children about the dangers of using mercury.
- **Distribute safety alerts addressing the possibility of mercury exposure in school laboratories.** Participants agreed that parents need to be informed of mercury's continued use in certain educational experiments. A solution to this problem would be to send home a one-page alert describing the situation and possible exposure risks.

5. Health Care Providers

- **Present information to health care providers at national and local workshops.** One target audience includes other health agencies who may not be aware of cultural mercury use. There was general consensus that distributing materials on the risks

associated with mercury to health care providers at national and local conferences, health fairs, and association events represent effective means to communicate this information to communities.

- **Provide education to health professionals.** Another target audience includes health professionals, including alternative or nontraditional health care providers. Building these relationships could result in enlisting some hospitals or clinics in clinical data-gathering efforts. Health professional education includes:

- T Distribution of physician's resource guides (such as those developed by Connecticut DHS and New York City Department of Health (included in Appendix A);
- T Presentation of grand rounds at local hospitals;
- T Direct consultation with health care providers;
- T Distribution of educational materials such as the *Case Studies in Environmental Medicine* to all health care providers in impacted areas; and
- T Providing training for health professionals on the possible psychological effects and neurobehavioral manifestations of mercury exposure.

5. POLICY OPTIONS

A variety of options are available to federal, state, and local agencies that begin to address the issue of mercury use in spiritual and folk traditions. The task force seeks to reduce mercury exposure, by recommending realistic and cost-effective actions that will promote health and well-being while respecting spiritual and folk traditions and community autonomy. This section describes various policy options considered by the Task Force. All available options are discussed below, and their feasibility and suitability assessed in light of these objectives.

5.1 Outreach and Education

A carefully planned outreach program that involves community groups and local health professionals would provide information to mercury users about its risks and available alternatives. Ensuring that health and risk-reduction information come from sources that are respected by mercury users is critical and requires the cooperation of religious leaders and authors/publishers of related materials. The provision of sample labels through such a program could allow for careful design and attention to cultural and language factors in risk communication not addressed by current labeling law.

ATSDR is best equipped to direct such outreach activities with its network of state and local health departments. The proximity of state and local agencies to, and previously established relationships with, the community will enable them to use effective outreach strategies. ATSDR has proposed a health education strategy focused broadly on the toxicity of elemental mercury in all settings of potential public exposure.

Challenges to community outreach efforts include the following:

- The need to understand and address risk perception issues, cultural and religious belief systems, language barriers, the role of non-traditional health care providers, and resistance by suppliers due to fear of prosecution, litigation, financial loss, etc.
- Message development will need to sensitively separate the dangers of mercury exposure and the social-psychological benefits of folk traditions and religious practice.
- Public health interventions will need to incorporate working with religious practitioners to find safe alternatives to mercury use without interfering with religious practices.
- Many outreach efforts have already been undertaken, but there was no evaluation of their effectiveness. Any new outreach effort must have an evaluation component with outcome measures.

Two important social and political factors present a challenge in outreach to communities that use mercury. First, some of the religions and cultural traditions involved have a history of government suppression and social stigma, leading to secrecy about practice. Second, many practitioners and

botanica proprietors are recent immigrants who may mistrust any “authority” representing federal, state, or local government. One strategy for addressing these issues is to make effective use of other educational efforts to prevent mercury exposure—for example, those targeted toward schoolchildren or people who eat fish. Distributing general information about the hazards of mercury is likely to reach a wider audience and be better received among cultural and religious users.

Mercury use may not be a top priority for groups focused on Latino and Caribbean health because it does not affect as many people as other key health issues such as access to insurance (especially among children), fighting diseases such as cancer and HIV/AIDS, controlling tobacco use, asthma, and prenatal care. Until there are good data linking cultural and spiritual mercury use with adverse health effects, Latino and Caribbean health organizations will be reluctant to get involved. Environmental health issues are a top priority for many of these organizations; for example, the NAHH maintains a hotline for indoor air quality. The hotline provides community members with information on a number of home contaminants including radon, lead, carbon monoxide, environmental tobacco smoke, asbestos, volatile organic compounds, household pesticides, biological contaminants, mercury, and asthma.

More outreach to community groups is needed to gain an understanding of what Latino and Caribbean communities in the United States, and especially those communities that use mercury, know and believe about mercury and its risks. This information is essential for designing effective risk-communication materials.

Working with spiritual consultants within these communities is essential for effective outreach. These spiritual leaders can authoritatively provide information to clients about the use of mercury, and may have knowledge of equally potent, non-toxic substitutes for mercury (Section 1.3). It is important for public health workers to understand the role of spiritual consultants as medical practitioners and businesspeople in the community to assess the opportunities for the integration of less toxic and equally effective substitutes for mercury.

Several different designs already exist for community outreach and education activities, but their effectiveness has not been evaluated. Persons involved in community outreach need to be clear about the expected outcomes, and the role of community groups, community leaders, local agencies, and federal agencies in these efforts.

Prototypes from New York City, Connecticut, Los Angeles, and Chicago were reviewed, as well as outreach strategies developed by EPA and ATSDR. Some key issues are discussed below.

- **Specific or general?** Some suggest that a more general approach to education about mercury and all its sources in the home will be better received by Latino and Caribbean communities, because it does not single out a stigmatized practice. Others worry that a general approach weakens the emphasis on practices that are potentially responsible for the largest exposures.
- **Role of community leaders and organizations.** Working with individual community leaders (physicians, priests, social workers, and spiritual consultants) and organizations holds promise for reaching out with credibility to a large number of

people. However, if this issue is not a priority for many leaders or groups, the message could get lost. Gaining the trust of these individuals and groups may also be challenging for federal or local agencies that approach them, especially if their local record on health issues has been lacking.

- **Role of state and local DOHs.** State and local health departments and environmental agencies are a critical link to implementing any outreach plan, because their proximity to communities is a great advantage for follow-up. If agencies have good working relationships with community organizations or leaders, the effort could go quite smoothly. Some agencies may not have the right contacts with the population they are trying to reach in this effort, and may have resource limitations that necessitate pursuing other priorities.
- **Role of CPSC, EPA, ATSDR.** Federal agencies can serve as a resource center that follows efforts in every region and tracks successes and challenges to be addressed, sharing information with local agencies. They can work to ensure consistency in the effort, so that communities are treated equally in the process. Federal agencies can provide an overarching plan and see it through to implementation by working with the state and local agencies. They are limited in their ability to follow through on a community level or to provide oversight of state and local activities.

The effectiveness of community outreach is more likely to be long-lasting than punitive approaches are, or those that seek to control the sales of mercury rather than the demand for it. Communication materials have already been developed by a number of community and governmental groups, but the process has broken down at the point of community distribution. Working with community groups to disseminate this information effectively should be a top priority.

5.2 Research Funding

EPA has already used its research-funding capabilities to understand better the extent of this problem in Connecticut, Illinois, and New York. Similar studies could be funded to answer a number of questions, including characterizing the extent of the problem, better understanding specific uses of mercury and their cultural contexts, and evaluating the effectiveness of outreach and education activities. EPA's Office of Research and Development has identified cultural and religious uses in its mercury research strategy, but has not funded any additional studies. Experience to date indicates that research efforts are effective when community members are positively engaged. Small research projects are likely to carry large benefits for sponsoring agencies. State and local health departments would benefit greatly from sponsoring local studies in their area to provide local knowledge and to establish relationships with the community.

5.3 Regulatory Information-Gathering Provisions

Dr. Wendroff has called for EPA or CPSC to subpoena sales records of *botanica* wholesalers. Were such information gathered, it could provide a bounding estimate of mercury sales. The two most likely justifications for government intervention in this case would stem from either labeling violations, the jurisdiction of CPSC, or from violations of occupational health limits for mercury vapor, the jurisdiction of OSHA. CPSC's information-gathering authority is narrowly directed to

obtaining products and product labels[141]or obtaining records related to interstate commerce[142]. CPSC and OSHA have few resources to support such action.

Under certain circumstances, EPA could conceivably use CERCLA 104(e)[143]or similar provisions in other environmental statutes to query *botanica* wholesalers about the quantities of mercury that come through their businesses. The information on sales would be gathered to estimate the likelihood of an environmental release from mercury spills during the packaging process (mercury is poured into gelcaps), or from leakage or failure of mercury-filled gelcaps, which are more delicate than other containers typically used to store or transport mercury. Clearly, occupational and consumer exposure are the primary concern here, not environmental releases, thus suggesting that CERCLA may not be the most appropriate statute for gathering this information.

It may be easier to gather information at a local level, where there may be more complete knowledge of the businesses and populations involved. However, state and local agencies may have less authority to acquire this type of information.

5.4 Labeling Mercury at Point of Sale

There are several ways to support labeling of mercury that is sold in *botanicas*. The FHSA[133] contains provisions for the labeling of hazardous substances, described earlier in this report. CPSC is charged with enforcement of labeling regulations. The CPSC's authority is broad, but its resources limited, so that the commission's actions are usually targeted toward large distributors or corporations. The CPSC has taken action (via enforcement letter) against major suppliers of mercury to *botanicas* and *botanica* wholesalers. The problem now lies with many small distributors, rendering enforcement activities resource-intensive for CPSC.

FHSA is very general in its labeling requirements, such that enforcement of the law may not ultimately lead to effective risk communication. For example, although the CPSC recommends that labels be multilingual to reach all potential users, this is not actually required by the FHSA. Local and state labeling statutes may also apply, and may have stronger requirements that lead to more effective labeling.

There are three primary enforcement approaches for federal, state, and local officials:

- **Voluntary compliance.** If community outreach is successful, it may be possible to work with *botanicas* toward increased voluntary compliance with labeling regulations, or the inclusion of other warning information – for example, a brochure – with the product at the point of sale. A sample label template photocopied for distribution by each establishment, for example, could be shared in a cooperative manner by local environmental or health departments, or community organizations. This is a “harm reduction” approach that would work with *botanicas* to provide more information on their product. There may be some resistance to voluntary labeling, because of anticipation of decreased sales if the product appears hazardous.
- **Non-punitive inspection visits.** This approach would consist of informing *botanica* proprietors of the law, then visiting to check for compliance. Non-compliance would be met with a warning or a strongly worded request for compliance. In the New York area, this approach has been implemented, and many *botanicas* now deny selling mercury, although it can be purchased by insiders. Such an approach is difficult to implement in a manner that is perceived as truly non-punitive by the community, especially when *botanicas* are singled out for inspection, while other stores that sell unlabeled mercury (e.g., plumbing supply or hardware stores) are not inspected.
- **Punitive fines.** A more punitive approach would involve inspections and fines, which fall under the jurisdiction of the CPSC or state and local agencies, where applicable. Such an approach is time-intensive, requiring the redirection of the efforts of the small number of inspectors to police potentially hundreds of *botanicas*. The CPSC does not have the power to recall the product, but can ask that it be labeled in the future. A fine of up to \$3,000 may be imposed under the FHSA when a hazardous substance is found to be sold without a label, or mislabeled. Punitive enforcement would likely have a negative community impact, adding to mistrust of government officials and interfering with other methods to mitigate exposure. This approach is likely to drive mercury sales underground, and not ultimately address the problem of indoor mercury use.

5.5 Supply Limitation

Sections 6 and 7 of the Toxic Substances Control Act (TSCA)[130] and Section 7003 of the Resource Conservation and Recovery Act (RCRA)[144] might be explored as avenues that could potentially be used at the federal level to stem the supply of mercury from wholesalers to retail *botanicas*. Better data are necessary to document how widespread the problem is before a determination can be made on whether an action might be justified under TSCA to restrict the sale of mercury for these particular religious and cultural uses.

Other reservations and concerns were raised about a supply-limitation approach. Regulating only against *botanica* retailers could be construed as a violation of the First Amendment: the Supreme Court has struck down laws that impact only certain religious groups[145]. Regulating *botanicas* alone would also mean that mercury would continue to be available through other means; for

example, by breaking open thermometers. A crack-down targeted to these communities may worsen already strained relations with immigrant populations, drive mercury sales underground without significantly impacting use, and hamper outreach efforts. Thus, a TSCA or RCRA action would have to be broader and impact the use of mercury in other consumer products as well. Such an action would certainly be resource intensive, and may not find political support at this time.

State and local governments may have more flexibility and less political resistance in proposing or implementing similar policies. Many state and local agencies have sponsored exchange programs for mercury thermometers or banned the sale of mercury-containing consumer products in their jurisdiction, or both. A national effort to remove mercury from schools[146]has resulted in several states and local jurisdictions passing legislation on mercury elimination.

5.6 Exposure Limitation

Botanicas and wholesalers are workplaces with potentially high mercury levels because of the packaging activities that may occur there. NIOSH recommends occupational exposure limits at 50 $\mu\text{g}/\text{m}^3$ as an 8-hour (TWA)[22], but this standard was set in the 1970s, and both the ACGIH and WHO have lowered their recommended TWA to 25 $\mu\text{g}/\text{m}^3$ in recent years[23].

An approach to reducing domestic exposure or mitigating the effects of exposure in the home involves mandating or encouraging testing of dwellings for mercury vapor when the mercury is sold, or establishing a “right-to-know” for buyers or new tenants, as in some states require for radon or lead. Similarly, a local or state policy promoting routine testing of children for mercury at a certain age, as is done for lead, may be helpful in identifying chronic exposure cases.

5.7 Technical Assistance and Response

RCRA 7003[144]and CERCLA 106(a)[147]both provide for remedial actions when threat of release to the environment exists. RCRA 7003 is more flexible in determining what constitutes a “release” but is not attached to funds that could cover some of the costs. A variety of similar laws exist at the state and local levels that govern the cleanup of contaminated buildings. Identifying contaminated dwellings would be difficult to impossible without the cooperation of the residents, because access is required to obtain air samples. Barriers to voluntary reporting to local authorities include the stigmatized nature of the practices, immigrant uneasiness dealing with authorities, and the potentially significant financial burden of cleanup.

If remediation efforts are undertaken without prevention education, it is likely that dwellings or *botanicas* will become re-contaminated by subsequent mercury use. Because of the great expense of mercury cleanups, those who pay for it will want some assurance that re-contamination will not occur.

To date, there has been no demonstrated need for a clinical response strategy tailored specifically to the spiritual and cultural use of mercury, because of a lack of reported exposure cases. There is a need to gather data from existing sources regarding if and to what extent intentional domestic uses of mercury pose a public health threat. The first step before any remediation or clinical response is to define the nature and extent of intentional domestic uses or elemental mercury. If a clinical response is necessary, the response must meet ATSDR’s criterion for an environmental health intervention and would require environmental data that would meet the criteria for a public health

hazard. Should it become necessary to develop such a strategy, ATSDR can provide guidance in public health practice through ascertaining the public health implications of exposure scenarios and the development and adaptation of the current response strategy. ATSDR can assist in developing an integrated risk management protocol on the basis of environmental and biological sampling that includes the following:

1. **Development of exposure history screening tool** to identify individuals at risk for mercury exposure and in need of further investigation. This tool would likely be a mailout survey or survey in connection with a call-in hotline at a local health department or community information center in conjunction with a national community and health provider plan. Positive screens will be followed up with “exposure driven” sampling and biological sampling, described below.
2. **Standardized analysis and biological sampling strategy.** ATSDR can facilitate collection of biological samples by providing training and education to health professionals on urine mercury collection and interpretation. ATSDR can establish a mechanism between the states and National Center for Environmental Health to analyze the biological samples. A standardized analysis and sampling strategy will strengthen risk management decisions to protect public health.
3. **Development of detailed exposure history during biological sampling;** a more detailed exposure history will be elicited to help identify exposure sources, routes, intensity, duration, and frequency, as well as other individuals who may be exposed.
4. **“Exposure driven” environmental samples** could be taken in human contact areas of known use, to ensure that other family members or persons who come in contact with mercury vapor can be identified. Without these data it would be difficult to document the exposure source. To prevent further exposure, finding the source is imperative.
5. **Integrated clinical evaluation and referral protocol** to evaluate and characterize exposure to mercury and related health effects, to facilitate appropriate referrals and follow-up of exposed individuals. Clinical referral networks would need to be established with the Association of Occupational and Environmental Health Clinics including Pediatric Environmental Health Specialty Units to consult with physicians who have questions and concerns regarding the diagnosis and treatment of patients exposed to metallic mercury. Clinical evaluations for those determined to be exposed allow early detection and prevention of adverse health effects among highly exposed persons. Experts in occupational and environmental medicine perform exams on eligible patients, including appropriate medical and exposure history, physical exam, lab work, follow-up, and referral as necessary. The protocol does not provide for treatment. Before clinical evaluations, a plan for continued follow-up of any conditions discovered shall be in place in conjunction with local and state health departments.

6. RECOMMENDATIONS

In Chapter 5, the Task Force describes various policy options for addressing the issue of spiritual and folk uses of mercury. This section focuses on those actions the Task Force recommends be taken by various governmental and non-governmental organizations. These recommendations are those of the Task Force members, and are not binding on any organization. The Task Force recommendations seek to reduce mercury exposure by recommending realistic and cost-effective actions that will promote health and well-being while respecting cultural traditions and community autonomy. The Task Force recommends approaches that rely primarily on community outreach and education activities to inform mercury suppliers and the public about mercury's risks, and encourage the use of safer alternatives. Because there continues to be a paucity of data on the extent of use of mercury for these purposes, the fate and transport of mercury indoors, and the exposure that might result from these uses, the Task Force prioritized a number of areas for further study and research. The Task Force recognizes there are many competing priorities for research, and that government agencies, and non-governmental organizations must balance these recommendations against other existing priorities.

6.1 Community Outreach and Education

A coordinated effort between state and local health departments and local community organizations can help inform mercury suppliers and the public about mercury's risks. Government agencies can play a supportive role in these activities.

EPA/OERR

1. **Develop a brochure on mercury describing its hazards and what to do if mercury is spilled.** This brochure will serve as a template that can be used by local groups in designing their own communications. The brochure is intended primarily for distribution via the Web.
2. **Produce a written statement for distribution to community groups on the do's and don'ts of mercury use.** This was widely requested by forum participants, this "official message" should also include messages from the brochure and emphasize the importance of community leaders in outreach.
3. **Encourage funding** to assist CBOs and local health departments involved in outreach and education activities.
4. **Work with various EPA offices to incorporate mercury in existing education programs, where appropriate.** Because of the perceived success of programs addressing lead and asthma, there was general support for incorporating the issue of mercury and its health effects into existing programs in the Office of Children's Health, the Office of Indoor Air, and the Office of Toxics. It would be particularly effective to add cultural mercury use issues to the indoor air hotline, and to EPA's Tools for Schools kit.

ATSDR

1. **Encourage state and local health departments** to partner with CBOs in their area and develop an effective outreach strategy, as outlined in the next section.
2. **Encourage the addition of the issue of mercury to existing education programs, where appropriate.** There was general support for incorporating the issue of mercury and its health effects into existing programs that deal with similar health issues, such as Indoor Air Quality Programs (e.g., carbon dioxide and lead); Asthma Programs; and Prenatal Care Programs. The Woman, Infants, and Children (WIC) approach is a good model. Mercury exposure questions should be included on the NHANES and HANES surveys. Secondhand exposure should be included in another line of questioning, such as how long has the exposed person lived in their residence, etc. Early education childhood prevention programs should follow or be attached to lead questions.

Regions/Local Health Departments/CBOs

1. **Plan, implement, and evaluate local education and outreach activities.** Much of the outreach and education on mercury use is necessarily local. Forum participants agreed that grassroots education efforts are most likely to be effective. Although federal agencies can provide general guidance about the content of a warning message about mercury use, it is up to state and local health departments working with CBOs to tailor the message to the local audience and deliver the message effectively. The collective wisdom compiled from the participants in the forum on Ritualistic Uses of Mercury on conducting outreach and education can be found in section 4.5. There was consensus that partnerships between local and state health departments and CBOs are most effective at promoting mercury programs.

Community-Based Organizations

1. **Communicate with publishers and authors of religious/spirituality books** that contain mercury spells, to request inclusion of a specific note about the risks of using mercury and how to reduce risk in practice – or a consideration of alternative spells that use non-toxic substances.

6.2 Research Agenda

The following key research areas should be prioritized against other existing priorities:

1. **Clinical studies** to identify elemental mercury levels in people. Ideally, levels of mercury would be examined in the bodies of mercury users versus a control group. Twenty-four hour urine mercury samples could be obtained rather than spot samples, and the mercury could be speciated. Follow-up would connect exposures to particular sources and use patterns. Given the real-world constraints imposed by funding issues and the stigma associated with cultural mercury use, some modifications will have to be made. For example, anonymity and the convenience associated with spot-urine sampling are needed to attract participants. A simplified research strategy might only consider base screening mercury levels in Latino and Caribbean communities versus other communities. Although researchers should strive toward detailed measurement studies where possible, the studies should, at a minimum, measure the incidence of exposure and impact of mercury on the community. Incorporation of mercury tests into other routine tests – for example,

child blood-lead levels – might be an effective way for local clinics to collect useful data. ATSDR has IRB guidelines that govern clinical studies involving human subjects, and these must be followed for any clinical study.

2. **Ethnographic research** to identify the needs, beliefs, and exposure patterns in specific subpopulations, and to understand the frequency and extent of different uses, sales rates, and mercury supply chains. Such research would better characterize the mercury-using population, illuminating how mercury is used and its exposure implications, as well as its cultural meaning or significance. Identifying safe alternatives for mercury used by practitioners in a variety of cultural and religious contexts is also desirable. ATSDR will not participate in any research efforts pertaining to altering religious practices. Participant observation should be a particularly effective research tool for this work.
3. **Risk perception and risk communication research** that evaluates the effectiveness of communication materials and outreach strategies, and provides input for improved designs for both. Market research approaches are also valuable here in understanding the audience and designing salient messages with immediate practical application. Stakeholders should be involved in ongoing discussions of risk management, and in the design and evaluation of risk communication materials.
4. **Fate and transport studies** of mercury in indoor air to better relate cultural use to acute and long-term exposure levels, and to develop models to predict indoor concentrations and residence times. Air measurements in vehicles, residences and *botanicas* are needed to validate these models and measure typical exposure levels stemming from cultural and religious uses.
5. **Epidemiology and toxicology** studies aimed at understanding low-level health effects of mercury and exploring novel biomarkers for exposure assessment are needed. Small grants (such as those provided in the past by ATSDR and EPA Regions 2 and 5), will be sufficient and effective for sharing key information for most of these studies. Priority should be given to proposals that represent true collaborations with active involvement of community groups with demonstrated access to exposed populations. Private foundations may be a source for funding on this issue. Some academic professional organizations in sociology and anthropology may provide small grants for new projects in this field. Finally, the federal and state health care and clinical health community may be an additional funding source for many of these studies. The Office of Minority Health in the Department of Health and Human Services, for example, may have an interest in some of these research areas.

6.3 Environmental Monitoring

EPA

1. Provide guidance on the use of generally accepted ambient levels of mercury.
2. Provide guidance on instruments and detection limits to use when sampling for mercury. The NIOSH 6009 method is the standard method used to monitor for mercury. Newer instruments have been developed that are more portable, and can provide faster and cheaper measurements. Guidance is needed on the use of these newer instruments to ensure their precision and accuracy when compared against the standard NIOSH 6009 method.
3. Provide guidance on action levels of mercury.

6.4 Technical Assistance and Response

1. Any clinical response must meet ATSDR's criteria for an environmental health intervention and would require environmental data that would meet the criterion for a public health hazard. If these conditions are met, a response framework would be constructed. ATSDR is prepared to provide guidance in public health practice through ascertaining the public health implications of exposure scenarios and the development and adaptation of the current response strategy. ATSDR is ready to assist in developing an integrated risk management protocol based on environmental and biological sampling, should one become necessary in the future. Any cleanup response to mercury releases on the Federal level must be pursuant to the legislative and regulatory authorities of CERCLA.

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ADDENDUM

Since the last official meeting (August 7, 2001) of The Ritualistic Uses of Mercury Task Force, it has come to EPA's attention that there have been either new developments in the area surrounding mercury use in spiritual and folk traditions or additional references that were not considered by the Task Force.

ADDITIONAL RESEARCH

U.S. EPA Office of Emergency and Remedial Response

Outreach and Education

OERR's Community Involvement and Outreach Center and ATSDR have entered into a \$60,000 cooperative agreement with the National Association of City/County Health Officials (NACCHO) to work with local health departments to develop outreach and education programs designed to raise awareness about hazards of mercury and encourage use of safer alternatives.

Fate and Transport of Mercury

The Environmental Response Team is performing fate and transport studies in Edison, NJ to help understand how much mercury is released during spiritual and folk practices. EPA expects to publish results of the studies in a peer reviewed journal and present findings at various conferences.

New Jersey Department of Environmental Protection

The New Jersey Department of Environmental Protection (NJDEP) is conducting a study to find out more about mercury usage in Santería and other practices and measuring mercury levels in multifamily dwellings. The work is being carried out under the direction of Alan Stern of NJDEP, Michael Gochfeld of the Environmental and Occupational Health Sciences Institute, and Donna Riley of Smith College. The study intends to find out more about mercury usage in Santería and other practices in New Jersey, by conducting interviews with mercury users in Union City and West New York. The santero member of the research team has currently conducted 22 interviews with santeros/as, espiritistas, and other practitioners. During the interviews, discussions were held on the ways in which they do or do not use mercury in their work. The other portion of this study is concerned with measuring mercury levels in multifamily dwellings in Union City and West New York, in block areas with 80+% Latino population, within 0.5 miles of *botanicas*, and in Montclair, NJ, a predominantly white, non-Hispanic community with buildings of similar size and age. The Lumex atomic absorption spectrometer was used to obtain data in the common areas (lobbies and hallways) of these buildings. The final report will discuss the findings of this study in greater detail.

U.S. Department of Housing and Urban Development Office of Healthy Homes

The Department of Housing and Urban Development agrees that the increase in public awareness in general about the risks of mercury exposures is essential. HUD's Office of Healthy Homes and Lead Hazard Control is tracking the progress of research efforts underway at the National Center for Environmental Health and other research organizations. This information will also provide health care providers with the information they need to target specific populations of children for routine mercury screening. To supplement current outreach measures, the Office of Healthy Homes and Lead Hazard Control has expanded its efforts in this area, briefing HUD's regional environmental specialists of the risk factors associated with mercury exposure and developing an

information packet for HUD field offices, Public Housing Authorities and other HUD clients, that will include material from the Task Force report.

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APPENDIX A: OUTREACH AND EDUCATION BROCHURES

- 1. 1991 Consumer Product Safety Commission Alert: *Mercury Vapors are Hazardous***
- 2. 1994 EPA Office of Pollution Prevention and Toxics Information Fact Sheet: *Hazards to Consumers Using Metallic Mercury In the Home Environment***
- 3. 1994 EPA Mercury Alert**
- 4. 1995 EPA Office of Emergency and Remedial Response: *Warning - It's Dazzling, It's Slick, It's Awesome, It's Mercury, and It Can Kill You!!***
- 5. 1997 EPA/ATSDR: *National Alert***
- 6. EPA Office of Emergency and Remedial Response National Mercury Brochure Draft: *Protect Your Family from Mercury in Your Home***
- 7. Puerto Rican Family Institute: Mercury and Your Health: *How to Prevent Metallic Mercury Poisoning***
- 8. Puerto Rican Family Institute: *Public Health Education: Bodegas***
- 9. Hispanic Health Council Environmental Health Unit Information Booklet No. 1, Hartford, CT: *Metallic Mercury and Your Health: An Educational Guide for Health Care Providers and Azogue Distributors***
- 10. Concilio Hispano De La Salud Unidad De Salud Ambiental Pamflete No. 1, Hartford, CT: *El Azogue (Mercurio Metalico): Y Tu Salud: Una Guia Educacional Para Proveedores De Servicios De Salud Y Distribuidores De Azogue***
- 11. Hispanic Health Council Environmental Health Unit Information Brochure No. 2, Hartford, CT: *Azogue and Your Health: How to Prevent Metallic Mercury Poisoning***
- 12. Concilio Hispano De La Salud Unidad De Salud Ambiental Pam Informativo No. 2, Hartford, CT: *El Azogue Y Tu Salud: Como Prevenir Envenenamiento Con Mercurio Metalico***
- 13. New York City Department of Health: *Metallic Mercury Poisoning***
- 14. New York City Department of Health: *Metallic Mercury Exposure: A Guide for Health Care Providers***

At this time Appendix A is not available via the Web. Please E-mail Karen L. Martin at martin.karenl@epa.gov to request a copy of Appendix A.

APPENDIX B: MINUTES FROM FORUM PANELS

The viewpoints expressed in these minutes are solely those of individual forum participants and not necessarily those of the Environmental Protection Agency, Agency for Toxic Substances and Disease Registry, Consumer Product Safety Commission or the Ritualistic Uses of Mercury Task Force.

Panel Session I: Members of Religious and Cultural Traditions That Use Mercury

Eric Canales

Eric Canales works at the New York Academy of Medicine as the Community Liaison/Associate Project Director at the Center for Urban Epidemiological Studies. Mr. Canales is an ordained priest in Palo Mayombe, with is an expression of African spirituality. He has worked with Pastor for Pastor, an organization that informs clergy of health disparities and educates these leaders in intervention-based programs. In addition, Mr. Canales has consulted with the EPA, Montefiore Hospital, and the City of New York Department of Health on the cultural and religious uses of mercury.

Palo Mayombe originated in Africa, specifically, from the Bantu religion. Palo Mayombe is well recognized in Africa and Afro-Caribbean communities and has also been embraced by many European and Japanese communities. Mr. Canales pointed out that the increasing Latino population in the United States brings with it an increase in the number of people practicing religions of Afro-Caribbean origin. Despite the predominant focus on Latino and Caribbean populations, Mr. Canales indicated that many other cultures that use mercury are not being targeted, for example, Hindus and Native Americans. In addition, the diabetic community in East Harlem commonly uses mercury for healing. In his experience, mercury is not used to a large degree in Palo Moyombe and if it is used, it is contained in a prenda. Mr.. Canales described a prenda as a consecrated container about the size of a soup tureen that contains a mixture of natural things, possibly mercury. As the foundation for religious belief, the prenda is sealed and is never opened again. Mercury use is not widespread across Palo Mayombe practice. Mr. Canales explained that mercury is a component of the prenda because it is part of nature, part of what God has placed on this earth, like the wind, trees, and ocean. Palo Mayombe is similar to many Native American religious beliefs in that Palo Mayombe uses things like mercury from nature. Mercury will most likely remain in use. Rather than trying to take it out of the practice, Mr. Canales suggested education to help people think about the risks involved in using mercury.

Mr. Canales stressed the importance of reaching the right people, in particular religious leaders and ordained practitioners. Godfathers and Godmothers (spiritual mentors who offer guidance to new initiates, sometimes referred to as “children”) need to know hazards of mercury; this knowledge may in turn be passed onto their children in the faith. In his opinion, Mr. Canales stated that many who prescribe mercury are unaware of its dangers. Although the New York City Health Department launched a commendable education campaign on mercury hazards, a grassroots initiative is necessary to ensure the message is delivered to the appropriate audience and subsequently understood.

Mary Jane Garza

Mary Jane Garza is a writer and artist who has been initiated into Santería, Reiki, lymphatic massage, and Curanderismo. She has presented many workshops to various healthcare organizations on promoting cultural diversity and sensitivity.

Ms. Garza began her presentation by expanding on the notion of diversity brought up by Mr. Canales by noting that mercury use may vary by region as well as ethnicity. To prepare for the forum, she visited various *botanica* owners and spiritual healers in her home town of Austin, Texas, to discuss the use of mercury. The *botanica* owners stated that mercury was not used very much, but reported that about 25% of their patrons request mercury for various home remedies and religious rites. Many *botanica* owners reported that do not sell mercury because of the dangers associated with its use; in addition they believe the sale of mercury is illegal in Texas. In Ms. Garza's experience, mercury is not heavily used in Curanderismo; however, it seems that those who are asking the botanicas for mercury are the more recent immigrants. Ms. Garza noted that all the *botanica* owners she spoke with expressed a desire for more information and handouts on mercury exposure for their customers. Ms. Garza then inquired into local public schools regarding the use of amulets or necklaces containing mercury. The schools, which had a high number of Latino students, did not indicate that such amulets were commonly worn by the students.

Americo Paez

Americo Paez was initiated as priest of Orisha worship, also known as Santería, at age 16. In April 2000, he helped found the Lukumi Church or Orisha, the first church of its kind to be recognized as a nonprofit organization in the state of New York. Mr. Paez provides religious and cultural training to priests and all interested peoples, teaching the ways of the ancestors. One of the principal goals of the training program is to organize practitioners to create an environment of uniform practice.

Mr. Paez began his presentation by providing background on Santería. Santería, which goes by many names, came to the United States from Cuba, and originated among the Yoruba tribes in southern Nigeria. According to Mr. Paez, Santería practices do not use mercury; however, Santería does not prohibit practitioners from belonging to other religions that may practice with mercury. Therefore, just because someone uses mercury and happens to also be a Santero does not mean that the mercury use is a part of Santería.

Mr. Paez emphasized the importance of education. The community of Santería, in addition to other religious communities, is close knit and deeply connected. Community members see each other as neighbors and as family; no one would willingly place another in danger.

Michelle Edouard

Michelle Edouard is employed as Senior Human Services Program Manager for the Miami-Dade County Health Department in Miami, Florida. Prior to her work for Miami-Dade County, Dr. Edouard served as Executive Director of Profamil, Family Planning Association of Haiti, and Chief

of Evaluation for the Ministry of Public Health of Haiti. Her outreach efforts have been acknowledged by USAID, the National Cancer Institute, and the Florida Volunteer Agency for Caribbean Action.

Dr. Edouard served as a speaker on the practice of Voodoo, which she stated is a secretive religion. Voodoo is practiced to varying degrees, with those at the higher levels possessing knowledge of spells and rituals that lower practitioners do not. Such spells are by nature kept secret and passed down through oral tradition. Because it is not documented, it is difficult to know if mercury is involved at such high levels. Dr. Edouard explained that people who practice Voodoo often subscribe to more than one religious faith. For example, approximately 95% of the population in Haiti practices both Voodoo and Catholicism. Although Voodoo is not a centrally organized religion and is practiced differently in varying regions, its rituals are practiced to achieve three basic things: remedies for ills, satisfaction of needs, and survival.

Dr. Edouard stressed that distinction between the core traditions of Voodoo oral traditions passed down for 200 to 300 years and the materialistic expressions or symbols of the faith, such as necklaces. The core traditions, even if these include rituals that involve mercury, will not change, but the materials used in such practices can. People have been forbidden to practice Voodoo through slavery and the suppression by the Catholic church for centuries. The rituals have persevered throughout this time and will not cease.

Before the forum, Dr. Edouard went to a *botanica* and asked how she should use mercury. She was told to rub mercury on her skin with perfume for good luck.

Questions/Comments:

Donna Riley added that in her talks with Max Beauvoir, Voodoo priest at the Temple of Yehwe in Washington, DC, Mr. Beauvoir had distinguished between what he called “magical” use and spiritual or traditional use.

Arnold Wendroff said that he was familiar with a Migene Gonzalez-Wippler book, that lists several spells in which she uses mercury. He proposed that this was evidence that mercury is used in Santería.

Eric Canales replied that not everything that is written about Santería is true and added that Ms. Wippler was not an initiate in the religion. Santería is often associated with similar religions because of its origin; the term Santería was given generically to any religion that used a Catholic saint and practiced spiritism. Santería is a cultural, slave term that encompasses the African roots through Caribbean practice.

Americo Paez added that the most knowledgeable people, those with 30 or 40 years of experience in practicing Santería, are not asked for information. Usually, the first people who are willing to speak are trying to make a name for themselves.

Arnold Wendroff inquired into the reported use of mercury for treating empacho.

Mary Jane Garza responded that empacho was a blocking of any kind, including stomach cramps. She said that she usually prescribes bitter herbs and eggs to treat this condition, not mercury.

Michelle Edouard noted that treatments tend to vary depending on the area. Typically, folk remedies are used because of the lack of access to adequate medical treatment.

Nancy Jeffery directed a question to Mr. Canales and Mr. Paez: Are practitioners knowledgeable about mercury hazards?

The panel responded that recent immigrants are generally unaware of mercury hazards. These immigrants do not have the benefit of mainstream education in schools and various media outlets. Some indigenous knowledge seems to exist showing that ingesting mercury will cause one to become insane.

Mr. Canales emphasized that this issue is a cultural issue, a people of color issue. He has met people who were unaware of the hazards of mercury but who want their children to be protected.

Mark Maddaloni asked Mr. Canales for a better understanding of where mercury fits into beliefs of Palo Mayombe?

Mr. Canales replied that the answer predates history and is an inextricable element of a religious rite. He then reiterated the fact that mercury placed in the prenda is contained, sealed, and never opened again. Eliminating mercury would invalidate the rite. If laws against mercury exist, people will cross state and country lines or break thermometers to get the mercury they need.

Rita Monroy posed a question: If there is such minimal use of mercury in each group, should outreach materials target practitioners of these religions or the general public?

Mr. Paez answered that he thinks it is worthwhile to target people through religious groups and offered the mailing lists of his church.

Mr. Canales said that both the general public and the practitioners should be targeted for outreach materials. By using posters and public service announcements, the impact of mercury exposure to could be minimized for everyone. However, new immigrants and new initiates especially need the information.

Ms. Garza brought up her concern that an educational campaign could backfire by making people curious about mercury, especially if the message is from the government. Government regulation

over cultural affairs is not widely respected and is viewed with distrust. Perhaps the message would be more effectively received if delivered from a church or peer.

Gary Garetano inquired about the frequency and quantity of mercury use?

Mr. Paez replied that mercury is used in bath water, perfume, homes, cars, and businesses such as botanicas. It can be used in a myriad of ways, and often repetitively.

Dr. Edouard stated that people use mercury to attract luck and love; it will be used until these things are perceivably met. Some *botanicas* encourage frequent mercury use because it is better for business. Mr. Canales added that some people use the mercury until a problem is finally solved; for instance, until they get a job. Some people (like Hindus) use it everyday.

Craig Beasley inquired as to which religious denominations use mercury?

Mr. Canales replied that across the board, people use mercury in bath water and burn it in candles, as these are very common practices. Furthermore, he stated that Hindus use a variety of metals in addition to mercury to attract wealth.

Ms. Garza commented that it is common in Texas to put mercury in a glass of water beside the door. She has also heard of one person putting it in food, but not very often.

Mr. Paez brought attention to the dangers of using mercury in liquids, and then discarding the mixture. Often it is flushed down the toilet or left in a field causing environmental hazards and increased risk of exposure.

Question: How educated are botanica owners in religious practice?

Mr. Paez replied that, in New York, a botanica is just a business. Owners are vendors of herbs and remedies but are not experts.

Ms. Garb answered that all the botanica owners that she has dealt within Texas are very knowledgeable about all the religions.

Mr. Canales added that in New York City, botanicas used to sell groceries and were viewed as cultural centers. Today, a botanica owner may be a Santeros, but is usually just seen as a vendor. Ordained priests and recognized elders (godfathers and godmothers) prescribe the rituals and their necessary elements.

Dr. Edouard stated that this was not the case in Florida. *Botanica* owners in Miami and nearby areas are practitioners and are very knowledgeable in the faiths. People come to them for emotional, spiritual, and psychologic healing (there is less emphasis on physical). Delivering the message about the dangers of mercury is difficult because the people who are using it may not understand the

pathology of toxic exposure. They may believe that disease is caused by something in their life that is not spiritually aligned.

Nina Habib Spencer asked if there were alternatives and whether or not people would be responsive to alternative?

Dr. Edouard replied that in recommending an alternative to mercury, it is important to ensure that the alternative is not a toxic substance, that is capable of possibly causing more harm than the mercury. She reported that when asking for mercury at a certain *botanica*, she was offered a stronger powder that was not labeled.

Mr. Canales said that people are not always responsive to alternatives because it contradicts traditions, and generally people are reluctant to change.

Dr. Edouard answered that in Haiti a myriad of herbs are available in rural areas that could be substituted for mercury. However, in urban Florida, many of these herbs are not available. Lacking the ability to practice traditional folk remedies, people then look for something more readily available than modern medicine, such as mercury.

After recounting a story of a woman who went mad after frequenting a botanica and who returned and stoned the store, Clyde Johnson asked panel members if there were concerned about a specific practice that may be particularly dangerous?

Mr. Canales stated that the danger of developmental damage from inhalation of mercury vapor needs to be stressed. Candle burning is very common in New York and is particularly harmful because the exposure to mercury through inhalation. Most communities know that ingesting mercury will make you crazy and therefore rarely intake it this way.

Ms. Garza stated that in Curanderismo, mercury is not a vital part of practice. However, she is concerned about amulets or necklaces containing mercury that are popular in Texas. These can be purchased at *botanicas* along the border of Mexico, are unregulated, and can break easily.

Mr. Paez said he is most concerned about mercury use in floor washes and baths. It is a repetitive practice that relies on constant application.

Mark Maddaloni asked how the mercury is mixed with water?

Mr. Paez answered that you mix it with the water and then attempt to get it on your body.

Mr. Canales added that it is typical to use a little bit of mercury with herbs and a small amount of water.

Gary Garetano asked how mercury is used in candles and whether it was purchased in candle wicks?

The panel answered affirmatively and said that sometimes candles are sold with mercury in wick and the bottom metal part of the candle.

Dr. Edouard added that mercury is sometimes mixed in oil lamps.

Donna Riley asked whether there are special stores that Hindus frequent to buy mercury?

Mr. Canales answered that he was not sure, but knew that some Hindus get their mercury from the botanicas.

Donna Riley asked if the panel had concerns about people following the directions in popular books on Santería and Voodoo found in new age book stores and other places?

Mr. Paez agreed that it is a problem and added that some of the same authors who wrote books on Santería also wrote new age books.

Mr. Canales reminded the group that these books are not bibles. The ancestors shared the practice verbally; it is not written down.

Dr. Edouard agreed and added that a central element of Voodoo is secrecy.

Ms. Garza said that Curanderismo came from the Aztecs, who had documented the faith in libraries. However, once Cortez began to persecute the religion, it became an oral tradition.

Clyde Johnson asked if a relationship exists between mercury use in the Americas and the mercury found in Egyptian tombs?

Ms. Edouard felt that this may be a possibility. She explained that there is no word for mercury in Africa; however, the term that is used for mercury in Haiti (*vidajan*) is a derivation of the French phrase *vif argent* (quick silver). This would imply that mercury use is not of African origin, but European.

Arnold Wendroff added that in his studies he has not found evidence of mercury used in African religions. He said that he believes that it came from Europe and that the Spanish brought it to America to extract gold and silver, possibly attributing the metal with the characteristic of attracting wealth. It was also widely used as a cure for syphilis, portraying the healing powers of mercury.

He then asked that if the health education community were able to demonstrate the deleterious effects that mercury has had on certain populations, will people be convinced of the dangers and change their practices?

All panelists agreed that people would be amenable to change if the message is clear, practical, and comes from a trusted source.

Mr. Paez added that people have preconceived or illegitimate ideas about different practices, but when they are shown the right way, they are usually willing to change. The older generation is more resistant to change and does not want to feel that they have been wrong about something for all this time.

Do you think that more younger or older people are using mercury?

The panel replied that it is both young and old who are using mercury. Mostly it is people who are new to the country.

Mr. Canales said that some people buy 5 to 10 capsules per month. Some elderly people are die-hard users. He stated that outreach on other health issues does occur at group gatherings and places of worship during celebrations. For example, some groups pass out information about sexually transmitted disease and distribute condoms. Such intervention needs to be constant because the community is always changing and transforming.

Dr. Edouard stated that in Miami, a great amount of cross-cultural interaction and exchange occurs. At flea markets, Haitians and Latinos exchange information and practices, despite the fact that they may not share the same language or culture.

Panel Session II: Health Educators with Latino and Caribbean Communities

Lisa Rose-Rodriguez

Lisa Rose-Rodriguez has been a devotee of Santería for 8 years. She is also pursuing a master's in public health at the University of Connecticut in epidemiology. She has undertaken "Mercury Poisoning During Santería Rituals" an independent research project, with the blessing of the Connecticut Department of Environmental Health. As a devotee and a graduate researcher, Ms. Rodriguez conducts workshops for health care workers, social workers, and other health and human services professionals so that they may build rapport with clients who are Santería practitioners, influence better outcomes, and increase service utilization.

Ms. Rose-Rodriguez was the first panelist to speak. She is of Portuguese ancestry and lives in Connecticut. She is currently pursuing a graduate degree at the University of Connecticut in which she works to link together culture and epidemiology. Ms. Rose-Rodriguez is a devotee of Santería, but is not an initiate. With respect to the initiates present, she said that she disagrees with Eric Canales and Americo Paez in their assertion that the rituals will not change despite outreach efforts.

Ms. Rose-Rodriguez began her presentation by defining many of the terms used and placing them in the appropriate context. Santería means "of the saints" and is the synergistic union of the Yoruba religion and Catholicism derived among the slave communities of French, Spanish, and Portuguese slave owners. The Yoruba was the largest ethnic group removed from Africa. Ironically, the purveyors of the Yoruba cultures in America are the Cuban, Caribbean, and Latin American communities, rather than the African-American communities. *Orisha* is a Lukimi word for deity. *Brujeria* is a Spanish (primary Mexican-Spanish) word for witchcraft or person of knowledge.

In Ms. Rose-Rodriguez's experience, mercury is used most often with worship of *Elegguá*. There are different levels of worship. For example, a banishing can be conducted by using mercury on a person's house or purchasing a "run-devil-run" candle at a *botanica*. An increase in levels of magic relates to a stronger effect. Each level is a higher exposure to mercury.

Ms. Rose-Rodriguez stated that if white men went to a *botanica* to distribute brochures, they would be treated with hostility as an outsider. Ms. Rose-Rodriguez said that she had distributed a survey to practitioners asking them about their level of initiation and the level that they prescribe mercury. From the surveys, Ms. Rose-Rodriguez noted that most devotees are female and most commonly requested works were those thought to bring love and protection. She also brought a catalog to the forum from which mercury products can be ordered from a California-based company that sells.

Ms. Rose-Rodriguez said that in her experience with the Connecticut Department of Environmental Health, mercury poisoning cases exceed those of lead poisoning cases. The department sponsors a program that focuses on identifying speech delay and other developmental delays in children; however, it is difficult to separate the origin of developmental delay from mercury exposure given complicating factors of poverty, including lack of prenatal care. It is hard to establish a case

exposure because the use of mercury is secretive and knowledge of its use is inexact. Mercury can be inhaled, ingested, or absorbed.

Ms. Rose-Rodriguez reported that candle dressing has caused some concern in Connecticut hospitals. If the mercury is smeared on top of a candle, there is the risk of inhalation exposure. If it is used in the Wiccan ay, which is to apply the dressing to hands and then smear it on the outside of a candle, there is risk of exposure through skin absorption.

Ms. Rose-Rodriguez had some of the preparations from *botanicas* analyzed for mercury and found that all dedications to the Seven Powers; that is, the seven main deities of Santería, and *Elegguá* contained mercury. These preparations included powders, baths and oils. She concluded her introductory talk with the suggestion that the message for prevention of the practitioner, in outreach materials.

Suzanne Nicoletti-Krase

Suzanne Nicoletti-Krase is a registered nurse and holds a master's of science degree in community health education and a doctorate of education in health education. She is Director of Patient Relations at the Brooklyn Hospital Center. Dr. Nicoketti-Krase has supervised, mentored, and trained students in community outreach research.

Dr. Nicoketti-Krase shared with the forum her outreach experiences with West Indian and Latino communities through a newly developed family practice center through a Brooklyn-based nonprofit organization known as the Church Avenue Merchants Block Association (CAMBA). The CAMBA Center provides one stop shopping for comprehensive primary and preventive health care, case management, and legal assistance that is easily accessible to all members of the community. Center services include family practice/internal medicine, pediatrics, OB/GYN, dentistry, cardiology, radiology, podiatry, optometry, pulmonary function, nutrition, and physical and speech therapy.

CAMBA's health division is dedicated to linking isolated people to primary care. Although not directly related to mercury prevention, CAMBA is useful model for reaching the Haitian, Dominican, and Central American communities. CAMBA's purpose is twofold, to reduce the use of emergency rooms as primary care centers, and to stress preventive medicine. Prior to instituting the program, Dr. Nicoketti-Krase and others conducted a community profile of the neighborhood, noting all area businesses and community organizations in an attempt to make contacts. Realizing that community members might be suspicious of health care providers from outside of the community, the program used these contacts to recruit health advocates from within the community. Representatives from local schools and churches were trained to educated the community and to test for a variety of health indicators, such as blood pressure, glucose levels, and lead poisoning. These trained community advocates brought the message of CAMBA to the people through health fairs, tuberculosis screenings, and parenting classes. A prenatal care program called "Mothers Helping Mothers" was also established.

Dr. Nicoketti-Krase worked to obtain a primary care initiative grant that funded the training of advocates. The grant funded some insurance, materials in Creole and Spanish, transportation, and a quarterly newsletter for those enrolled in the "Stay Healthy Brooklyn Network." Additionally, Dr. Nicoketti-Krase collaborated on another grant for cancer awareness in the Puerto Rican community in Williamsburg, NY. Information was delivered through El Diario and other Spanish newspapers, as well as Spanish radio and television channels. Similar to CAMBA, the cancer awareness program recruited "role models" of health from the community to feature in each newsletter. Examples of topics included pap smears, mammograms, and smoking cessation. Neighborhood people distributed the newsletter and other educational materials to local establishments, especially beauty salons. Each volunteer was also asked to recruit one other volunteer. Dr. Nicoketti-Krase stressed the importance of advocates being multilingual and staffing care facilities with culturally sensitive people.

When planning a community advocate program, Dr. Nicoketti-Krase offered the following insights:

- It is important to know whether community advocates are people who will be respected by the community.
- Competition exists among community-based organizations; be aware of alliances that may hinder relationships with another organization.
- Have a plan for referring people that need further medical attention.
- Set up a system at the hospital or health care facility for handling language and insurance barriers. Educating the administration at the hospital required a lot of up-front internal work.

Abigail Juarez-Karic

Abigail Juarez-Karic has been the Director of Programs for the Puerto Rican Family Institute in Brooklyn, New York, since 1989. She has served as an adjunct professor at the New York University School of Social Work, where she received her master's degree. In 1996, Dr. Juarez-Karic earned a Ph.D. from the Columbia University School of Social Work.

Dr. Juarez-Karic began her presentation by dispelling the misconception that botanica patrons are uneducated, noting that she herself has been to a botanica. In describing her involvement in outreach with the Puerto Rican Family Institute, Dr. Juarez-Karic advised that the best way to get information to Spanish-speaking people was to have another Spanish-speaking person deliver the message. The message should be written simply and regularly played on Spanish radio stations. Her group has also seen positive outcomes from hosting events with food and/or paid audience participation as an opportunity to educate and disseminate information. Dr. Juarez-Karic also noted that women are typically the carriers of health-related messages, which is why distributing health information through beauty parlors is extremely effective.

Nancy Jeffery

Nancy Jeffery is the Director of the Environmental and Occupational Disease Epidemiology Unit in the New York City Department of Health. The unit which is responsible for conducting adult heavy metal surveillance (including mercury). Before Ms. Jeffery's 11 years with the New York City Department of Health, she worked as registered nurse (RN) at Loma Linda University Medical Center in California. Ms. Jeffery was the first RN to be enrolled in and complete an accelerated MPH program in epidemiology.

Ms. Jeffery explained that her experience in epidemiology and public health has not specifically focused on Latino and Caribbean communities; however, she and her department have been intimately involved in testing for mercury in many New York City botanicas. Her department investigates elevated levels of arsenic, lead, cadmium, and mercury. According to New York State law, physicians are required to report elevated levels of heavy metals to the New York City Health Department. Her department occasionally receives reports of elevated arsenic and mercury, but the majority of cases involve lead stemming from occupational exposures. To date, no reported cases of elevated mercury levels resulting from identified cultural practices have been reported.

Given the scarcity of data on mercury exposure, Ms. Jeffery and her group decided to focus on educational outreach as a preventative measure. The department adapted a brochure originally developed in Hartford, Connecticut and translated it into Spanish and Haitian Creole. They also created a brochure for health care providers, bringing awareness to the signs and symptoms of mercury toxicity in children. Overall, the department distributed 4,000 educational brochures to New York City botanicas (those with listed addresses), pediatricians, obstetricians/gynecologists, and general practitioners.

Ms. Jeffery stated that the biggest obstacle to conducting outreach was the ambiguity associated with just how to get the information to people who may have a non-occupational exposure. It seemed to her that it may be more effective to send the message from someone within the community as opposed to someone from a regulatory agency.

Michelle Edouard

Michelle Edouard was also a presenter in the first panel. As the Program Coordinator of the Childhood Lead Poisoning Prevention Program for the Miami-Dade County Health Department, Dr. Edouard has been instrumental in educating the Haitian American and other ethnic minority communities regarding toxic exposure to lead. Dr. Edouard began her presentation by describing the Community-Based Diffusion Model used for education outreach within Latino and Caribbean communities. Dr. Edouard's presentation is included here:

Community-Based Diffusion Model Essential Planning Principles

1. Know the client.

When getting to know your client base, it is important to avoid using broad racial characterizations because of the risk of stereotyping. You should be sensitive to beliefs and needs of the targeted group; learn the target groups educational level, literacy, language preferences and cultural practices; and identify the group's opinion leaders and its unique set of communication channels not easily identified by outsiders.

- a. ***Get To Know Caribbean and Latino Communities*** . In the United States, the Caribbean and Latino communities cluster in neighborhoods that provide social support (e.g., in Miami - Little Havana, Little Haiti, and Liberty City). The main languages spoken are English, Spanish, and Creole, but literacy is limited. Most Latinos read at least at a third-grade level, but many Haitians cannot read at all. Cultural practices and beliefs in these communities vary according to county of origin.
- b. ***Get To Know the Haitian Community***. The main language of the Haitian community is Creole, and the literacy level is extremely low. The community consists of Catholic or other Judeo-Christian Faiths; however, many Voodoo beliefs and practices used for spiritual survival developed during slavery were integrated into Catholicism.

- c. ***Get To Know the Latino Community.*** The main language in the Latino community is Spanish and is often preferred despite fluency in English. The literacy level is generally at third-grade level or higher. The Latino community consists mainly of the Catholic denomination, but many practice other Judeo-Christian religions; beliefs and practices vary country of origin. For instance, South American Latinos (except Brazilians) have practices and beliefs inherited from their Indian ancestors, while Caribbean Latinos and Brazilians share many beliefs and practices similar to those of Haitians.

Most public agencies do not have epidemiologic data to support a diffusion effort; therefore, community leaders and solicit their input for addressing target populations (focus groups). Community leaders can provide critical information about the community that may not be available to outsiders, such as familiarity with languages, health beliefs, education and literacy levels; knowledge of communication networks and opinion leaders; and social and professional ties in the community.

2. Assess Target Population for Risk of the Health Problem

Many leaders in Latino and Caribbean communities are unaware that mercury is used in rituals or for any other cultural reason by members of their ethnic group. However, Dr. Edouard noted that her visits to various botanicas in Haitian and Latino neighborhoods revealed that mercury is readily available and widely used. Mercury is well known by Haitian spiritual healers and their customers. Haitians refer to mercury as *vidajan*, the old French word for mercury, *vif argent* refers to quicksilver. Latino spiritual leaders and their followers call mercury by the name *azogue*.

Mercury can be used in a variety of ways. Haitians and Latinos mix mercury with perfume or dusting powder and then rub it on the skin. It is used as an ingredient in some traditional medicines, then ingested, sprinkled on the floor for good luck or used to wash the floors, kept inside vials or charm bags as a talisman, and placed in oil lamps or candles and burned. Mercury is used in these communities for an equal variety of reasons, such as for:

- protection and good fortune,
- warding off evil spirits,
- casting love spells,
- spiritual cleansing, and
- curing stomach ailments

Informal surveys and literature searches conducted show that mercury is mostly used for traditional medicine and as talisman but not often as part of rituals of Voodoo, Santería, or other religions. Rituals are difficult to change, but traditional medicinal uses are possible to alter.

3. Find the message

The right message is essential for a successful outreach campaign. For the behavior to change, the message must be understood. The problem or risk must be relevant to the target audience, and the recommendations must be acceptable. An educational message should acknowledge the importance of the product to the users and why they use. For many, the message will be tempered by considerations of health being more of a concern than respect for the tradition or the religious ritual. When formulating the message, planners should ask the following questions:

- Does protection from evil spirits matter more than health?
- Are alternatives to mercury acceptable to users?
- Are modern medicines available for ailments?
- Is there awareness and adequate access to health care?

Dr. Edouard offered the following as possible sayings to include in messages for the prevention of mercury poisoning:

“ You can get a better spiritual job by using products other than mercury.”

“Ask your Espiritista, Santero, Dokkte Fey or botanica for substitutes for mercury with similar power.”

“You deserve a perfect spiritual job.”

Focus groups serve as an effective method for involving the target population and prevent one from ignorantly entering into a social marketing campaign. Through focus groups, the receptivity of an idea can be tested in the actual target group. Focus groups should be conducted by recording reactions of a sample of 8 to 10 representatives of the target group.

During focus groups for a lead poisoning prevention campaign, the Childhood Lead Poisoning Prevention Program recruited parents of children 6months to 6 years of age from the target ethnic groups (Haitian farm workers, inner-city Haitians, Mexican farm workers, inner-city Cubans, and inner-city African Americans) to discuss values priorities. The results of the focus groups are listed below:

- Parents want a better future for their children (e.g., a college education).
- Parents would like to see the lead in a child’s body (something concrete, tangible).
- Parents want to know what a child with lead poisoning looks like (signs and symptoms).
- Colorful brochures on lead poisoning with photos of children of their ethnic group were preferable.

4. Identify Ways to Deliver Messages

Suggest means for delivering messages to target communities including bus and metro-rail advertising, posters, brochures, personal communication through social networks, broadcast on minority-specific media, participation in community events and health fairs. The three best practices for delivering the lead poisoning prevention message to Latino and Caribbean communities in Miami are:

- The Haitian-American Foundation Experience (radio program);
- National Safety Council Advertisement on Univision (Spanish TV channel); and
- Telesante (Haitian TV show).

Dr. Edouard explained that the ideal communication channels for Caribbean/Latino communities include television and radio media, so that illiteracy is not a barrier. Messages can be delivered at home, work, or in a car. Further more, ethnic and immigrant populations depend more heavily on radio and TV for news and entertainment.

Questions/Comments:

Arnold Wendroff stated that he has been calling the heavy metals disease registry to inquire about mercury poisonings to no avail.

Lisa Rose-Rodriguez replied that this may be due to the fact that many cases of mercury poisonings in the Connecticut disease registry are not directly attributed to a source.

Americao Paez discussed his concern that although he willing to help, he would lose the trust of the botanica owners if after coming forward, the government would fine them for not being in compliance. Should this happen, mercury sales would go underground and be uncontrollable.

Ms. Rose-Rodriguez agreed.

Nancy Jeffery reminded the group that it is not illegal to sell mercury in New York, but that labeling requirements do exist. The New York City Health Department sent a letter to botanicas informing them that if they sold mercury, it needed to be properly labeled. The following summer, a unit from the department visited *botanicas* to inquire about mercury labeling but did not fine anyone.

Recounting a visit that he had made to botanicas in 1991, Arnold Wendroff stated that two shops admitted to selling mercury. Furthermore, he noticed that mercury had been spilled in a botanica and was contaminating the store. He reported it to the Occupational Safety and Health Administration (OSHA). After the botanica was subsequently fined, he found it increasingly difficult to purchase mercury because he is a white male.

Ms. Jeffery reported that when New York City Department of Health sent a group out to the botanicas, it was with an educational motive, not a punitive one. The Spanish-speaking members of the department were sent with the intention not to scare but to inform the owners of an important public health risk. Obtaining funding for outreach on a problem with no reported cases is difficult. Resources have to be allotted to many other health issues. Ms. Jeffery said we need to have perspective. Rather than focus on what did not work, let us move forward.

Clyde Johnson stated that his student who had surveyed botanicas knew of a church where mercury was readily available. In the church, the candles were dressed with mercury treatment. He then asked how widespread this use was.

Ms. Rose-Rodriguez replied that she brought to the forum the catalog from which *botanica* owners purchase items wholesale. All the candles are dressed in this manner (Eric Canales disagrees). It could be a possible survey question: Do you dress your own candles?

Clyde Johnson then asked what would be the best way to get the message to the priests?

Ms. Rose-Rodriguez stated that the first step is identifying them, which is difficult because the practices are secretive and involve complex levels of initiation.

Susana Baumann, New Jersey Department of Health, added that an effort needs to be made to push the involvement of similar “culture officers” to involve in outreach efforts.

APPENDIX C: SCHEDULE OF TASK FORCE PLENARY CALLS

- 1. January 21, 1999**
- 2. March 18, 1999**
- 3. June 3, 1999**
- 4. July 29, 1999**
- 5. September 16, 1999**
- 6. October 28, 1999**
- 7. December 8, 1999**
- 8. February 2, 2000**
- 9. March 29, 2000**
- 10. May 11, 2000**
- 11. August 17, 2000**
- 12. October 5, 2000**
- 13. December 18, 2000**
- 14. February 15, 2001**
- 15. March 28, 2001**
- 16. May 9, 2001**
- 17. June 28, 2001**
- 18. August 7, 2001**

APPENDIX D: INTERVIEWS WITH COMMUNITY GROUPS

Interview Questions: Cultural and Religious Organizations

1. What is your involvement in Latino and/or Caribbean faith traditions?
2. How and why is mercury used in Latino and/or Caribbean faith traditions? With what frequency is it used?
3. Are you aware of any health risks associated with the uses of mercury?
4. Where and how would one obtain mercury (botanicas, from chemical supply stores or Internet)? What is the volume of standard purchases? Are there warning labels on the vial?
5. How widespread are cultural and religious uses of mercury?
6. What are possible alternatives to using mercury in cultural practices?
7. How should the hazards associated with mercury be communicated to users? Who should be involved? Who should organize the effort? Who should serve as a point of contact in the community?

Interview Questions: Public Health Organizations

The following questions were asked of individual and organizations that promote public health initiatives and provide various additional health and human services:

1. Are you aware of any cultural uses of mercury in Latino and Caribbean communities?
2. Does your organization regard the cultural use of mercury to be a significant public health threat?
3. If so, what (if any) intervention and/or educational efforts is your organization taking to address the issue?

TABLE D-1 INTERVIEW REQUESTS

NAME	ORGANIZATION	LOCATION	COMPLETED
Rita Monroy Adolph P. Falcón Eliana Loveluck	National Alliance for Hispanic Health	Washington, DC	Yes
Miguel Flores Cristina Encinas	Latin America Youth Center	Washington, DC	Yes
Dr. Sarah Lister Donald P. Hoppert	American Public Health Association	Washington, DC	Yes
Brent A. Wilkes	League of United Latin American Citizens	Washington, DC	Yes
Mauricio Pardon Ojeda	Pan American Health Organization	Washington, DC	Yes
Max Beauvoir	The Temple of Yehwe	Washington, DC	Yes
Earl Lopez	National Institute for Latino Development	Washington, DC	No
Rev. Mark F. Hughes	Saint Gabriel's	Washington, DC	No
Rev. Horace Grinnell	Saint Anthony of Padua	Falls Church, VA	No
Rev. Msgr. W. Ronald Jameson	Cathedral of Saint Matthew the Apostle	Washington, DC	No
Rev. Tarsicio Buitrago	Blessed Sacrament Church	Alexandria, VA	No
Rev. Gerard Creedon	Saint Charles Borromeo Church	Arlington, VA	No
Joe Garcia	Cuban American National Foundation	Miami, FL	No
Raul Yzaguirre	National Council of La Raza	Washington, DC	No
Larry Gonzales Arturo Vargas	National Association of Latino Elected and Appointed Officials	Washington, DC	No
Sue De Larosa	Sierra Club	San Francisco, CA	No
Linda Hanten	National Hispanic Leadership Institute	Washington, DC	No
Vanny Marreo	National Conference of Puerto Rican Women, Inc.	Washington, DC	No

NAME	ORGANIZATION	LOCATION	COMPLETED
Jennie Torres-Lewis Manuel Mirabal	National Puerto Rican Coalition	Washington, DC	No
Migdalia Rivera	Latino Institute	Chicago, IL	No

Interview Summary 1 - The National Alliance for Hispanic Health

Date: October 4, 2000

Interviewee (s): Rita Monroy - Executive Director, NAHH
Adolph P. Falcón, MPP, Vice President, Center for Science and Policy
Eliana Loveluck, MSW, Director, Center for Consumers

Background and Purpose

On October 4, 2000, Peter Redmond and Donna Riley of the U.S. EPA met with key members of the National Alliance for Hispanic Health (NAHH) in Washington, DC. The purpose of this meeting was to:

- Establish new relationships with members of NAHH and to reinforce existing ones
- Determine the priority of mercury poisoning on the NAHH agenda
- Seek feedback on an outreach strategy aimed at reducing mercury exposure in Caribbean and Latino communities.

Results

Representatives of NAHH spoke freely and candidly about the problem of addressing cultural uses of mercury in the Latino community. The interviewees also shared their insights on the efficacy of the Task Force's efforts, past, present, and future, in dealing with the issue. The following issues were identified as the most inhibiting factors regarding the Task Force's progress.

1. There is a lack of clinical data linking the sale and use of mercury to adverse health effects.

There has been a lot of discussion within the Task Force over the issue of cultural exposure to mercury; however, there are not empirical data exists to support the claims by some that this represents a public health crisis. NAHH has yet to see conclusive evidence in clinical studies indicting that a significant problem with mercury poisonings exists among the population at large, let alone within the Latino community. Even less information is available documenting the health implications of mercury exposure through cultural and religious uses. As a public health advocacy group for the Latino community, NAHH takes seriously each campaign it investigates and subsequently endorses. NAHH judiciously reviews issues on the basis of their validity, as well as potency as a public health threat. As a result, NAHH preserves the integrity of its actions and messages, in addition to its credibility in the Latino community. NAHH cannot move on an item such as cultural and religious mercury exposures without strong data indicating that a problem exists. NAHH also felt that the current paucity of human data contributes to the lack of participation of many organizations originally involved in the Task Force.

2. Specifically targeting communities that incorporate mercury in cultural practices will only isolate them further, hindering any intervention or outreach efforts.

Headquarter nationally, NAHH is structured around a network of Latino health care providers and consumers. Members consist of community based organizations and individuals, committed to educating the Latino community on health matters and strengthening their health and social service infrastructures. This grassroots approach is ideal for reaching Latino communities isolated from mainstream media and health care services. However, even NAHH admits difficulty in reaching religious practitioners such as Santeros. A campaign targeting cultural ceremonies of Santeria may be perceived as a frontal assault on sacred beliefs, causing further isolation and caution toward outsiders. NAHH believes that by utilizing the cultural and religious uses of mercury as the primary vehicle for intervention, the Task Force will not be successful in curbing its use. NAHH stated that it is difficult to estimate the number of Santeria practitioners in the Latino community, partly due to its loosely organized structure and secrecy of its practice. Despite this, NAHH felt that cultural and religious use of mercury was not a major force in the Latino community.

3. The Task Force has not responded to actions suggested by NAHH.

Some time ago, NAHH submitted a proposal to EPA for hosting a forum between Latino organizations and scientific community. NAHH claims EPA did not respond to this proposal, hence their gradual decrease in participation on the Task Force. Originally, four to five Latino organizations were involved in the Task Force; however, as time progressed and little activity was displayed on the part of the Task Force, other pressing issues took priority. This is true for NAHH as well.

Recommended Actions

Environmental health issues affecting the Latino community are becoming increasingly important to NAHH. Recently, NAHH released a report stating that reducing the adverse health effects of environmental toxins was a priority in the NAHH agenda. From its standpoint on addressing environmental health issues, NAHH made the following suggestions for the Task Force.

1. Do not focus on the cultural and religious uses of mercury, but broaden the scope to include all possible domestic exposure routes.

NAHH strongly felt that the most effective means for addressing cultural uses of mercury was to include the issue in a broader campaign that examines all possible domestic exposure routes. After discussing the recent events in Chicago which revealed thousands of possible mercury leaks from gas meters, NAHH indicated that using this aspect could open the Latino community to home testing. This approach does not single out the Latino community; rather, it incorporates them with a larger group sharing a similar problem. Furthermore, an incident such as this removes any fear of stigmatization or blame in reporting deliberate use of mercury, and improves the chances for cooperation with regard to indoor air sampling.

2. Solicit clinical data from hospital studies that document mercury exposures through elevated mercury levels in urine or blood.

As a public health agency, NAHH feels that the most effective data will be clinical data to show evidence of incidents of mercury poisoning. Gathering data that document adverse health effects will be easier than going into people's homes and taking environmental samples. Realizing the costs and time associated with national trials, NAHH suggested sponsoring smaller regional studies and extrapolating the data to get an idea of the larger picture.

3. If quantitative data indicate that mercury poisonings are occurring in certain communities, investigate the source.

Once a reasonable estimate of confirmed and possible mercury poisonings has been reached etiology of the exposures may be investigated. Cultural and religious use may only contribute to a small portion of poisoning cases, in which case it is best addressed in the context of all domestic exposures. Only if the cultural and religious use of mercury proves to be a significant public health problem in its own right should the issue be addressed individually. Because of the cultural sensitivity associated with this issue, NAHH stated that public health education and outreach would have to come from a trusted source for it to be heeded by the Latino community.

Interview Summary 2 - The Latin American Youth Center

Date: March 22, 2001

Interviewee (s): Miguel Flores
Christina Encinas

Background and Purpose

On March 22, 2001, representatives of the Ritualistic Uses of Mercury Task Force met with members of Health Education Division of the Latin American Youth Center (LAYC) in Washington, DC. The purpose of this meeting was to:

- Establish new relationships with members of LAYC,
- Determine what, if any, knowledge and experience LAYC has had with mercury poisonings, and
- Seek feedback on an outreach strategy aimed at reducing mercury exposure in Latino and Caribbean communities.

Results

The LAYC is a nonprofit youth and community development organization dedicated to serving at-risk Latino youth. In addition, the group works closely with Vietnamese, Caribbean, African-American and African communities in Washington, DC. The LAYC offers programs in academics, health education, job training, social services, leadership development, substance abuse prevention, housing, arts, humanities, and recreation. The Health Education Division of LAYC is actively involved in grassroots community outreach. Through its health education programs, LAYC focuses on issues such as HIV/AIDS education, family planning and teen pregnancy, and sexual development. Of particular note is the LAYC Teen Health Promoters, a program designed to train local teenagers in peer-provided education and support to teen clients of Mary's Center for Maternal and Child Care and Unity Health Care Upper Cardozo Clinic. LAYC additionally provides a peer support program that encourages youth to resist risky sexual behaviors.

As a community health advocacy organization, LAYC expressed a sincere interest in the efforts of the Task Force. Although active in community health education, particularly youth oriented, neither representative was familiar with or aware of cultural and religious uses of mercury. Before the interview, Miguel Flores informally solicited information from his colleagues regarding the nature and extent of cultural and religious uses of mercury in the Latino community. From this inquiry, Mr. Flores discovered that although Santeria is practiced in the D.C. Latino community, it is not known whether mercury is incorporated in the faith practices. Mr. Flores did learn that mercury can be used in home remedies for various illnesses, and that mercury for this purpose can be purchased in nearby botanicas. It was his belief that despite labeling regulations, many consumers are either unaware that the product being purchased contains mercury, or are unaware of mercury's toxic effects.

Recommended Actions

LAYC felt that the Task Force has two hurdles to overcome in its effort to educate Latino and Caribbean communities about the hazards associated with cultural and religious uses of mercury. The largest impediment is the lack of information concerning the magnitude of this issue. It is not well known who is using mercury in a religious manner, how often, or how much. Despite their willingness to assist the Task Force, LAYC stated that paucity of information prohibits the launching of an educational campaign. The second challenge facing the Task Force is the extremely small and esoteric population being targeted. Attempting to educate what essentially may be an underground community will be difficult, even for groups with intimate ties to the community such as the LAYC.

Representatives from the Health Education Division of the LAYC recommended that the most effective means for addressing the cultural and religious uses of mercury is to conduct a wide reaching campaign that encompasses the hazards of mercury in general. This would include possible cultural and religious routes of exposures through work and/or schools. Christina Encinas, the Health Education Programs Director, recommended that an extremely effective means for distributing this information is through Spanish-language television channels, and by developing education videos in Spanish.

Recommended Contacts

Council of Latino Agencies

Interview Summary 3 - American Public Health Association

Date: March 22, 2001

Interviewee(s): Dr. Sarah Lister
Donald P. Hoppert

Background and Purpose

On March 22, 2002, representatives of the Ritualistic Uses of Mercury Task Force met with members of American Public Health Association (APHA) in Washington, D.C. The purpose of this meetings was to:

The purpose of this meeting was to:

- Establish new relationships with members of APHA,
- Determine what, if any, knowledge and experience APHA has had with mercury poisonings, and
- Seek feedback on an outreach strategy aimed at reducing mercury exposure in Latino and Caribbean communities.

Results

Mercury-related education efforts undertaken by APHA have almost exclusively dealt with methylmercury exposure, encouraging reduction of mercury into the nation's waterways, advising pregnant women to avoid eating fish that may contain methylmercury, and encouraging the use of alternative mercury-containing consumer and health care products. As a national advocacy group, APHA published its position paper on methylmercury exposures in November 1999; however, the association has not issued any policy statements regarding elemental mercury exposures. APHA has had limited involvement with this issue, consisting mainly of a joint conference held between APHA and the American Academy of Pediatrics, at which the interviewees met with Phillip Ozuah, a researcher in the field of pediatric elemental mercury poisonings and a member of the Task Force. Members of APHA who were interviewed were unaware of any reported incidents of cultural and religious mercury exposures, not did they have any reports regarding mercury exposures in school laboratories.

It was suggested that the Environmental Division of APHA may possess more knowledge of potential mercury exposures through cultural and religious exposure routes. This division deals with issues in environmental justice and harm reduction, and would therefore be a better source of information on this topic. In addition, the environmental division of APHA has previously worked with EPA in regard to issues related to clean air and water standards. Mr. Don Hoppert agreed to solicit information on elemental mercury exposures from this division.

The Task Force expressed interest in seeking the APHA's assistance in developing and possibly conducting outreach strategies to prevent cultural and religious mercury exposures. APHA representatives suggested that should EPA develop an outreach and education strategy; APHA can issue an article summarizing the Agency's stance in its publications "Our Nation's Health," provided there is a definitive issue to address and a clear conduit for doing so.

Recommended Actions

Given the underground nature of cultural and religious uses of mercury, APHA recommended modeling an education and outreach strategy after the HIV/AIDS model. This model proved to be a successful tool for educating the public on an illness that was highly stigmatized in ways that blamed the victims, rather than being viewed as an indiscriminate virus rapidly creating a public health crisis. Due to the sensitivities associated with cultural and religious mercury use, it was also suggested that the Task Force avoid focusing too intently on religious routes of mercury exposure. This is in part due to the limited knowledge regarding the extent of such practices, as well as the level of difficulty involved with tailoring an outreach strategy to such a small community. APHA felt that by piggybacking onto broader mercury programs, such as methylmercury, the Task Force would more effectively address elemental mercury poisonings.

It was suggested that the Task Force should seek the input of cultural anthropologist familiar with cultural practices affecting health care. APHA agreed to contact the National Minority AIDS Council for possible contacts in the field of medical and cultural anthropology.

Recommended Contacts

National Minority AIDS Council
American Academy of Pediatrics
Hispanic Caucus, U.S. House of Representatives

Interview Summary 4 - League of United Latin American Citizens

Date: March 26, 2001

Interviewee (s): Brent A. Wilkes

Background and Purpose

On March 26, 2001, representatives of the Ritualistic Uses of Mercury Task Force met with Mr. Brent Wilkes of the League of United Latin American Citizens (LULAC) in Washington, D.C. The purpose of this meeting was to:

- Establish new relationships with members of LULAC,
- Determine what, if any, knowledge and experience LULAC has had with mercury poisonings, and
- Seek feedback on an outreach strategy aimed at reducing mercury exposure in Latino and Caribbean communities.

Results

Mr. Wilkes was not aware of the cultural and religious practices that use mercury in the Latino community, nor of the toxic effects of elemental mercury exposure. LULAC is aware of alternative means for health care through Latino communities practicing indigenous medicine; however, methodologies that incorporated mercury have not been reported. After briefing Mr. Wilkes on the background and purpose of the Task Force, Peter Redmond expressed the Task Force's desire to seek LULAC's input on communication inlets to Latino populations in this country. Mr. Wilkes inquired as to what sparked interest in this issue. Dr. Donna Riley then explained that attention to elemental mercury began to rise as botanicas in several major cities were found to be selling mercury without any knowledge of its toxicity. Dr. Riley also explained the concern over elemental mercury exposure via inhalation, and its particularly harmful effects in children.

LULAC is largely decentralized, comprised of 800 councils throughout the country. Each council operates autonomously, furthering agendas deemed important to the Latino constituency in that area. Programs instituted by LULAC predominantly deal with education, scholarships, and community networking. Public health issues are not typically addressed by the organization, although councils do assist in education when possible. Health education is largely done through grassroots networking, promoting healthy living. LULAC does advocate issues related to environmental justice in Latino neighborhoods throughout the country as well.

Recommended Actions

Mr. Wilkes offered to run educational pieces regarding elemental mercury exposure through its media channels, Web site, and national publication, *LULAC News*. He was of the opinion that

mercury use was not widespread among LULAC's constituency and that embracing the broader issue of mercury exposure as a whole was the most effective means for educating the public.

Recommended Contacts

National Council of La Raza
National Puerto Rican Association
Cuban American National Council
National Alliance for Hispanic Health

Interview Summary #5 - Pan American Health Organization

Date: March 26, 2001

Interviewee(s): Mauricio Pardon Ojeda

Background and Purpose

On March 26, 2001, representatives of the Ritualistic Uses of Mercury Task Force met with Mr. Mauricio Pardon Ojeda, Director of the Division of Health and Environment of the Pan American Health Organizations (PAHO) in Washington, D.C. The purpose of this meeting was to:

- Establish new relationships with members of PAHO
- Determine what, if any, knowledge and experience PAHO has had with mercury poisonings, and
- Seek feedback on an outreach strategy aimed at reducing mercury exposure in Latino and Caribbean communities.

Results

The PAHO is an international public health agency working to improve health and living standards of the countries of the Americas. It serves as the specialized organization for health of the Inter-American System and also serves as the Regional Office for the Americas of the World Health Organization. The Division of Health and Environment has two programs and one Pan American Center: Basic Sanitation; Environmental Quality; and Pan American Center for Sanitary Engineering and Environmental Sciences. The functions of the Division are to promote, coordinate, and implement technical cooperation activities directed toward diminishing the inequities related to the exposure to environmental risks. Its main focus is on the development of an intersectoral, holistic, and global approach to identify, evaluate, prevent, and control environmental risks for public health, with particular emphasis on the most vulnerable groups.

Before meeting with the Task Force, Mr. Ojeda requested information regarding the incidence of mercury exposure through cultural and religious routes. Among the countries from which this information was solicited were Cuba, Panama, Brazil, Mexico, Peru, and the Dominican Republic. All of the member countries indicated that data on this topic, if they do indeed exist, are limited and difficult to obtain. There was nothing to report at the time of the interview. EPA had contacted PAHO four years earlier in an attempt to locate anyone with knowledge on mercury sales, exposures, and/or poisonings within PAHO member countries. Mr. Ojeda indicated that in America, it may be much easier to obtain mercury in a botanica than for an individual in his or her home country. The reasoning behind this is that mercury is fairly expensive and there would not be a lot of incentive to burn it, as typical in some rituals. The only tangible incidents PAHO has been involved with concerning mercury exposure relate to industrial mercury spills.

Donna Riley and Peter Redmond explained to Mr. Ojeda that the paucity of clinical data regarding mercury exposure, has limited the scope of the Task Force. Given this situation, the Task Force is focusing on the hazards of mercury in general, a strategy that will include information on cultural and religious routes of exposure, but not focus exclusively on that topic.

Recommended Actions

Mr. Ojeda posed the question to EPA on what PAHO could do to assist the Task Force in its mission. Donna Riley stated that PAHO could provide valuable cultural insights into the uses of mercury, including who uses it, in what manner, how much is being used, when its being used, and where it is used. With regard to research, Mr. Ojeda suggested contact the Peru member office in which the Director General of Health and Environment had conducted extensive research on the health effects of mercury spills. Mr. Ojeda also indicated that he would be willing to solicit data from other countries on mercury use, provided the Task Force devise a list of questions on the issue for distribution to the health promotion and cultural representatives within the respective countries. Mr. Ojeda stated that PAHO has access to a vast amount of data and information in the field of medical anthropology, including topics such as folk medicine and spiritual healing. The Division also access to data regarding the incidence of exposure and poisoning to other toxic substances, such as lead tetroxide.

Recommended Contacts

Mr. Ojeda agreed to serve as the liaison between the Task Force and all PAHO countries to solicit data.

Jorge Villena, Director General of Health and Environment, Lima, Peru - jvillena@digesa.sld.pe

Interview Summary # 6 - Temple of Yehwe

Date: April 27, 2001

Interviewee(s): Max Beauvoir, Voodoo Houngan

Background and Purpose

On April 27, 2001, representatives of the Ritualistic Uses of Mercury Task Force met with Mr. Max Beauvoir, a Voodoo Houngan of the Temple of Yehwe in Washington, D.C. The purpose of this meeting was to:

- Establish new relationships with members of Temple,
- Determine what, if any, knowledge and experience Mr. Beauvoir has had with mercury poisonings, and
- Seek feedback on an outreach strategy aimed at reducing mercury exposure in the Caribbean, particularly Haitian, community.

Results

Max Beauvoir has been a practitioner of Voodoo in the Washington, DC, area for many years. He is well-connected and well-known in the Caribbean community, particular among Haitian immigrants. Like many Voodoo priests, Mr. Beauvoir provides his services through his temple, which is located in his home. Mr. Beauvoir explained that the site for many Voodoo rituals is in the practitioner's home, in keeping with religious tradition. The Voodoo community in the Washington Metropolitan area is close-knit, albeit somewhat underground. There appears to be several prominent religious leaders that are unknown to outsiders, yet are venerable figures within the African and Caribbean communities.

With regard to mercury, Mr. Beauvoir explained that it is used during certain practices that he described as "magic." The theory behind mercury's use is that the very physical nature of the metal enhances the spell's effectiveness. In Voodoo, mercury is viewed as a "magical" ingredient because its unusual properties (high surface tension, metal liquid at room temperature, and high density) seemingly defy the laws of nature.

Mr. Beauvoir described the manner in which mercury is often incorporated into Voodoo magic. Mercury is placed in a dish and then covered with oil, after which a candle wick is inserted and lit. Such rituals are performed on an as-needed basis, determined by the client seeking services in consultation with the priest. Mr. Beauvoir noted that typically, the practitioner would do this alone in his temple, and not in the presence of a client. Mr. Beauvoir stated that in 35 years as a practitioner he has never heard of anyone suffering physically from the effects of mercury used during such rituals.

Mr. Beauvoir said that Voodoo is closely linked to other Caribbean religions, such as Espiritismo, the predominant religion in the Dominican Republic. He said that Voodoo is considered to be the supreme religion that encompasses other faiths of African origin or influence such as Espiritismo. Haiti is the central location for the education of Voodoo practitioners, and draws people from around the world to study the religion, including practitioners of other African Diaspora religions such as Santeria. Mr. Beauvoir stated that to practice Voodoo rituals, one must complete the necessary training. When asked about “home rituals” that might be found in a popular book on Voodoo, he stated that they are not permitted unless exercised by an authentic Voodoo practitioner. There is no “do-it-yourself” practice in Voodoo, despite the large number of books marketing the religion in that way. Mr. Beauvoir’s practice emphasizes a holistic approach to Voodoo, one that incorporates self-reliance and self-improvement with rituals. A unilateral reliance on magic is not endorsed nor is it recommended by the Voodoo faith.

Recommended Actions

Mr. Beauvoir stated that despite people’s religious affiliation, they are reasonable and rational beings. As with the threats of lead, once educated on the possible damaging effects of mercury, the individual will stop using it or at least use it in a safer manner. The trick is finding the most effective means for conducting such educational campaigns. Mr. Beauvoir stated that media outlets for Latino and Caribbean communities (TV, radio, and newspaper) would be a good place to deliver mercury safety announcements. As for addressing cultural and religious uses of mercury, he suggested contacting religious leaders in outreach and education, lay persons may be more inclined to heed warnings of the hazards associated with religious mercury use if it comes from a trusted community figure.

When asked about banning the sale of mercury to curb the unsafe use of in religious practices, Mr. Beauvoir felt that this was not only unrealistic, but would be ineffective for two central reasons. First and foremost, Voodoo has been practiced for many years and is firmly embedded in Haitian and other Caribbean cultures. If a practitioner believes in its effectiveness, then a government mandate will do little to convince him or her otherwise. Second, a ban would be ineffective because of the inherent distrust that many believers of Voodoo have for Western society. Voodoo has been made a freakish spectacle by the entertainment industry, often portraying practitioners and believers as bloodthirsty savages eager to wreak havoc on the lives of those who have committed even mild transgression against them. Public scrutiny based on such outlandish accounts have in essence forced the practice of Voodoo underground, and away from regulation imposed government. There is little reason to believe that Voodoo practitioners and followers will be inclined to trust a society that does not completely understand or accept them.

Recommended Contacts

1. African Religious Coalition - Washington, DC
2. Yoruba House - Washington, DC
3. Mother Taylor - Religious leader in Washington, DC
4. Assar Auset Society - Ethiopian organization based in Washington, DC
5. The Akans Group

APPENDIX E: EVALUATING COMMUNITY OUTREACH EFFORTS

Below are a few resources that can assist groups in planning and conducting evaluations.

1. Georgia Tech Evaluation Tools. Available from URL: http://mine1.marc.gatech.edu/MM_Tools/evaluation.html.
2. Taking stock: A Practical Guide to Evaluating Your Own Programs - Horizon Research Group. Available from URL: <Http://www.horizon-research.com/publications/stock.pdf>.
3. University of Kansas Community Toolbox. Part J. Evaluating Community Programs and Initiatives. Available at URL: http://ctb.lsi.ukans.edu/tools/EN/part_1010.htm.
4. Mark Kline, Caron Chess, and Peter M. Sandman. *Evaluating risk communication programs: A catalogue of "quick and easy" feedback methods*. A book length summary and assessment of 22 tools for helping practitioners evaluate risk communication. 1989. Available from Rutgers University Center for Environmental Communication URL: <http://aesop.rutgers.edu/-cec>
5. Neil D. Weinstein and Peter M. Sandman. Some criteria for evaluating risk messages. *Risk Analysis*. 1993;13:103-114.
6. Neil D. Weinstein. What does it mean to understand a risk? Evaluating risk comprehension. *Journal of the National Cancer Institute*. 1999;25:15-20.