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Maria Castillo-Couch
University of Nevada, Las Vegas

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IDENTIFYING AND REDUCING LEAD EXPOSURE ASSOCIATED WITH THE
USE OF CULTURAL PRACTICES IN SOUTHERN
NEVADA HISPANIC COMMUNITIES

by

Maria Castillo-Couch

Bachelor of Arts
University of Nevada, Las Vegas
1973

Master in Public Administration
University of Nevada, Las Vegas
1997

A dissertation submitted in partial fulfillment
of the requirements for the

Doctor of Philosophy in Environmental Science
Department of Environmental Studies
School of Environmental and Public Affairs

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University of Nevada Las Vegas
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THE GRADUATE COLLEGE

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Maria Castillo-Couch

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School of Environmental and Public Affairs

Shawn Gerstenberger, Committee Chair
Helen Neill, Committee Member
Vern Hodges, Committee Member
Michelle Chino, Graduate Faculty Representative

Ronald Smith, Ph. D., Vice President for Research and Graduate Studies
and Dean of the Graduate College

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ABSTRACT

Identifying and Reducing Lead Exposure Associated with the Use of Cultural Practices in Southern Nevada Hispanic Communities

By

Maria Castillo-Couch

Dr. Shawn Gerstenberger, Examination Committee Chair
Executive Associate Dean
Professor and Chair of Environmental and Occupational Health

Despite large amounts of national data on lead and childhood lead poisoning, the status of childhood lead exposure in Nevada as a result of the use of cultural practices in the Hispanic population is unknown. The influx of immigrant Hispanic populations to Nevada, their low education level, the high number of them who are living in poverty present an increased risk for children to be exposed to lead through the use of imported consumables, home remedies and alternative medicine (i.e., healers/sobadores).

A 61-question survey collected data from Hispanics over 18 years of age who have or take care of children six years or under. Results from the study demonstrated a significant relationship exists in the proportion of children who had reported to suffer from empacho and from a stomach illness, $\chi^2 (1, N = 189) = 29.024, p < .001$. Children who had empacho were more than 2.1 times as likely to also suffer from a stomach illness. A total 8.5% of respondents whose children suffered from empacho also used Azarcón, a folk remedy containing a high percentage of lead, LR (1, N = 190) = 12.044, $p = .001$. A significant relationship exists between suffering from empacho and using a curandera/sobadora, $\chi^2 (1, N = 192) = 26.91, p < .001$. Individuals who reported their
children as suffering from *empacho* were 11.6 times more likely to use a *curandera*/*sobadora* than those who did not report having *empacho*.

Foreign born Hispanics were more knowledgeable and 2.8 times more likely to believe their "child had a high chance of getting elevated blood lead levels" as compared to U.S. born respondents, $\chi^2 (1, N = 212) = 3.814, p = .051$. These results were inconclusive but should be explored further. On the other hand, they had less knowledge than their counterparts regarding the cost for getting child tested for lead, $\chi^2 (1, N = 212) = 7.7, p = .006$ and the time needed for treatment of elevated blood lead levels, $\chi^2 (1, N = 212) = 3.4, p = .066$. Foreign born Hispanics were almost 2.6 times as likely to believe treatment for elevated BLLs would take too much spare time and 4 times more likely to believe the lead test would be too expensive.

There was a significant relationship between country of origin and language, with 96.6% of foreign born Hispanics and 35.4% U.S. born respondents choosing Spanish as their preferred language for prevention messages, $\text{LR} (1, N = 208) = 62.8, p < .001$. Language is an indicator of the degree individuals have acculturated to American society (i.e., the process whereby one group contributes more to the flow of cultural elements than the other, much weaker one). Language may also influence how these individuals respond to health promotion and behavior change campaigns and the type of media they choose. A lead prevention campaign to be developed will incorporate language, folk traditions and the importance of the nuclear and expanded family to be thoroughly involved in preventing their children from being exposed to lead through folk remedies, folk healers and other items identified in this study.
ACKNOWLEDGEMENTS

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Much appreciation also goes to Jonathon LaValley who came to my rescue in December 2010. He not only analyzed data from survey responses but translated the statistical jargon into a language I could understand. Without Jonathon, the dissertation would have taken much longer to complete. Dr. Chad Cross also provided assistance during my preparation for the oral defense. His clear and amazing explanations of the statistical tests used to analyze my data helped me assimilate the process and propelled me to an effective presentation. I will be eternally grateful for his kindness, since he was not even on my advisory committee!

To my husband Bob Couch, I thank him for allowing me to spend so much time engrossed in research and writing, away from family activity. His love and counsel has been a stabilizing force in my life.
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CHAPTER 1

INTRODUCTION

Nevada and Clark County Population

Nevada has been ranked as the fastest-growing state since the 1960s, with increases in population over 50% each year. Las Vegas, the largest city in the south and Clark County seat, grew by 84% from 1990 through 2000, while Clark County's population increased 81% for the same period (U.S. Census, 2000; Perry & Mackun, 2001). The U.S. Census 2009 State & County: Nevada QuickFacts estimates the Clark County population at 1,902,834 (2009c).

This large population influx has brought an ethnically diverse group of people from within the United States and foreign destinations. The total number of African Americans, Asians, Hispanics, Pacific Islanders, and Native Americans now account for almost 42% of Clark County's population (U.S. Census, 2007a). Over 21% of the people living in Clark County households in 2007 were foreign born (U.S. Census, 2007a, 2007b).

Hispanics represent the largest percentage of minorities living in Clark County. During 1990 to 2007, this group burgeoned from 83,000 to 511,145, accounting for almost 28% of the county's population (Pew Hispanic Center, 2007). The 2009 U.S. Census estimates for the Hispanic population shows that number has decreased to 508,411 (2009f). The largest percentage (77.8%) of those of Hispanic origin in this county come from Mexico (U.S.Census, 2009d, 2009e). Statewide, about 44% of Hispanics are foreign born, with 80% of the state's Hispanic population coming from Mexico (Pew Hispanic Center, 2008). Census figures do not reflect illegal aliens living
in Nevada; however, a report from the Pew Hispanic Center (2006) estimates there were 150,000 to 200,000 illegal aliens living in state in 2005.

Hispanics in the labor market (those with legal or illegal status) more likely worked in service oriented jobs (food preparation and serving), in construction and building/grounds keeping and maintenance (Pew Hispanic Center, 2006). Nationwide, 17% of construction workers were estimated to have illegal status by a 2008 report from the Pew Hispanic Center. Since 2007, employment opportunities in the state have decreased as a result of a recession, affecting the whole country. Over 33,300 jobs in the leisure/hospitality industries and 66,900 in the construction industry have been lost in Nevada from 2007 through November 2010. The state’s unemployment rate hit a high of 14.4% in September 2010, with a 15% rate in the Las Vegas Metropolitan area. Unemployment rates declined in October 2010 to 14.2% statewide and 14.1% in the Las Vegas Metropolitan area, then ticked up to 14.3% each respectively in November 2010 (Nevada Dept Emp., Training, and Rehabilitation, 2010a, 2010b; U.S. Dept of Labor, 2010). The Nevada populations of color have been affected at an unemployment rate for the Hispanic labor force of 18%, compared to 21% of the Black labor force and 13.3% of Caucasians in the workforce.

Hispanics tend to be younger (median age 26 years), have less education (50% graduate from high school) and earn less income than the general population ($34,400 vs. $50,000 median household income) (U.S. Census, 2007a). Data from a 2007 American Community Survey show 42% of Hispanics in Clark County are poor (36.5% of Hispanics have incomes at less than 100 to 125% of the poverty level and another 5.5% earn at less than 50% of the poverty level). An 11% of Clark County's total population is
estimated to live in poverty, with the poverty rate for children under 5 years at 10.1% and children who are 5 through 17 years of age at 11.2% (U.S. Census, 2008b).

Access to health care for Hispanics living below the poverty level is limited, especially if they do not meet eligibility requirements for social programs (i.e., Medicaid or WIC), because they lack U.S. residency or citizenship. In 2007-2008, Nevada's Hispanic uninsured population was estimated at 58.7% (354,000) by Families USA (2009) as compared to uninsured whites (26.8%). About 54,000 Hispanic children/youth aged 0 to 18 years of age whose income falls below 100/200% of poverty line are estimated to be uninsured for this time period in Clark County. Nearly 59% of illegal immigrants nationwide did not have health insurance in 2007 according to a report from the Pew Hispanic Center (2009). Among their children, almost half of those who are illegal immigrants (45%) were uninsured and 25% of those who were born in the U.S. were uninsured.

The demographic pattern for Hispanics presents further concerns for the prevention of lead exposure. Hispanic immigrants often occupy older housing and suffer prior exposure to lead (Morales, Gutierrez& Escarce, 2005; U.S. Census, 2007a; Tehranifar et al., 2008). Statistically significant higher blood lead levels (BLLs) have been found in Hispanic children living in monolingual Spanish-speaking households than in children who live in English-speaking households (Morales et al., 2005). About 78% of the Hispanic households in Nevada are monolingual Spanish, making this group an important population to study regarding childhood lead poisoning (Pew Hispanic Center, 2007; 2009c, 2009e). The lack of language skills and insurance coverage for this population are
barriers preventing the children from accessing preventive health care services that include blood lead screenings.

There are no observable symptoms for elevated BLLs, thus blood lead screening becomes an important recommendation for children under six years of age as a way to prevent lead poisoning. Young children absorb lead more easily than adults through the hand-to-mouth behaviors (Centers for Disease Control and Prevention [CDC], 1991, 2005b; ATSDR, 2007a, 2007b). Their growing bodies are more susceptible to adverse effects of lead, which can affect nearly every system in the body. Lead enters the body through ingestion and inhalation of traditional sources, such as leaded paint (i.e., peeling paint chips), dust from the air and soil, and from non-traditional sources such as leaded ceramic/clay ware, Mexican candies, toys, jewelry and folk medicines recommended by family members or healers/sobadores (alternative forms of medicine) (CDC, 2005; ASTDR, 2007a). Lead can accumulate in the blood, bone and other tissues as a result of repeated exposure. Elevated BLLs can cause learning disabilities, behavioral problems and, at very high levels, seizures, coma and even death. Exposure to lead at levels below the action level (10 µg/dL) established by the Center for Disease Control and Prevention (CDC) has been shown to affect the cognitive development of children aged six and under (CDC, 2005; Bellinger & Dietrich, 1994; Bellinger, Leviton, Sloman, Rabinowitz, Needleman & Waternaux, 1991; Bellinger, Stiles & Needleman., 1992; Dietrich, Krafft, Bornschein, Hammond, Berger, Succop et al., 1987; Dietrich, Berger, Succop, Hammond & Bornschein, 1993; Lanphear, Dietriech, Auinger, & Cox, 2000).

Cultural practices followed by Hispanics that use sources containing lead have been implicated in various elevated BLL cases. Researchers and health agencies have reported
on cases where lead has been found, such as in folk medicines used to treat empacho (a gastrointestinal illness), Mexican candies, imported pottery and ceramics, pewter key chains and bathtub tiles (Rothweiler, Cabb & Gerstenberger, 2007; Gorospe & Gerstenberger, 2008; Cabb, Gorospe, Rothweiler & Gerstenberger, 2008; CDC, 1998, 2002a; Baer & Ackerman, 1988; Baer, Garcia de Alba, Cueto, Ackerman & Davison, 1989; Baer, Garcia de Alba, Leal, Plascencia Campos & Goslin, 1998; California Dept Health and Services, 1993, 1994a, 1994b, 1998, 2001, 2004). In Clark County, the Southern Nevada Health District (SNHD) has reported investigating cases where folk remedies and candies have been hypothesized as potential causative agents responsible for increased elevated BLLs (SNHD, 2007). It is expected the fast growing wave of Hispanic immigrants in Clark County are at risk of becoming exposed to lead by cultural practices that include utilizing imported consumables (i.e., Mexican candies), folk remedies and clay vessels used for cooking and storing food and beverages.

Statement of the Problem

Despite large amounts of national data on lead and childhood lead poisoning, the current status of childhood lead exposure in Nevada is unknown. In particular, exposure of children to lead as a result of cultural practices among the Hispanic population is poorly understood (Rothweiler et al., 2007; Gorospe & Gerstenberger, 2008; Cabb et al., 2008). The influx of immigrant Hispanic populations during this last decade, their low education level, and the high number of these Hispanics who are living in poverty and without health insurance present an increased risk for children to be exposed to lead. Newly arrived immigrants to the United States have elevated BLLs, and although much of the lead in blood decreases over time when the exposure culprit is removed, the lead
that remains in the body is often stored in the bones (Geltman et al., 2001). Immigrants frequently continue to follow cultural and dietary practices, such as using imported consumables, home remedies and alternative medicine (i.e., healers/sobadores), which can result in higher exposure to lead (Tehranifar, 2008). While a few studies have been conducted on the lead exposure of newly arrived immigrants (Tehranifar, 2008; Geltman et al., 2001; Rothenberg, Manalo, Jiang, et al., 1999; Rothenberg, Khan, Manalo, et al., 2000), the majority of research on the lead burden of people of Hispanic descent has been conducted in Mexico (Morales et al., 2005; Romieu et al., 1994; Lopez-Carillo et al., 1996; Villalobos et al., 2009; Meneses-Gonzalez, Richardson, Lino-Gonzalez & Vidal, 2003; Hernandez-Avila, Romieu, Rios, Rivero & Palazuelos, 1991; Hernandez-Avila, Gonzalez-Cossio, Palazuelos et al., 1996; Hernandez-Avila, Smith, Meneses, Sanin & Hu, 1998; Hernandez-Serrato et al., 2003; Schnaas et al., 2004; Mexico's Secretariat of Health, 2005). Much of that research identify cultural practices (i.e., use of clay ceramics and consumables) as the culprits for high levels of BLLs in the Mexican population.

Since no study has been conducted on this topic in Clark County, a focused research about Hispanics was needed to identify if and how the cultural and dietary practices and use of non-traditional sources may be impacting this community.

Research Questions

Three research questions evolved from the literature review presented in Chapter 2. Research question (R\textsubscript{2}), however, was modified after the convenience sampling yielded a total 29 U.S. born respondents, with only 21 U.S. born Hispanics. With this limited number of Hispanics, it was not possible to compare data from each group to respond to the original (R\textsubscript{2}) question.
(R₁) What are the sources of risk for lead exposure from cultural practices followed by the Hispanic communities?

(R₂) Are foreign born Hispanics more prone to using cultural practices than Hispanics born in the U.S.?

New (R₂): Who are at risk for lead exposure from the cultural practices followed by the Hispanic communities?

(R₃) What is the best approach to prevent the at-risk population from becoming exposed to lead through cultural practices?

Purpose of Study

The major objective of this proposal was to identify the types of cultural practices being used by Hispanic populations in Southern Nevada that may increase the number of children being exposed to lead. To accomplish this task, it was important to collect data on health and folk beliefs, beliefs about lead poisoning and current use of cultural practices that increase the children's exposure to lead. The study collected data about Hispanic media preference, so that at the conclusion of the research, a communication campaign would present lead poisoning prevention messages to help reduce the number of Hispanic children being exposed to lead.

This study used culturally sensitive research methods, collecting data through a survey that was translated in Spanish and conducted by a bilingual researcher. Data collected provided the springboard for developing a social marketing campaign, using social networks (i.e., friends, radio, television, church, and media outlets) to present the message of prevention. Collaborations with non-profit organizations, whose members serve the Hispanic community, was of great value in reaching the low socioeconomic
families. Since nearly 78% of the Hispanic households in Nevada are monolingual Spanish (Pew Hispanic Center, 2007) and of low education levels, the prevention messages for the campaign will be developed in Spanish and in a culturally appropriate, easy-to-understand language. Brochures, bookmarks and PowerPoint presentations to be used in the promotion of the lead poisoning prevention messages are available at no cost through the SNHD Childhood Lead Poisoning Prevention Program (CLPPP). Materials on the dangers of using clay ware, ceramics, bean pots, jewelry and candy are easily accessible on the Web.

Chapter 2 reviewed the literature on lead exposure trends in the United States, how much lead is too much, routes of exposure and effects, how lead is introduced in the environment, studies on non-traditional sources of lead through cultural practices, how socioeconomic factors affect elevated lead levels, the importance of primary prevention, regulatory agencies overseeing exposure to lead, the Hispanics’ cultural values and beliefs and communication barriers that need to be addressed when the lead poison prevention communications campaign is developed from the data collected in this study.

Chapter 3 discussed the research topic and questions, the research design, the hypotheses that address the research questions, expected outcomes, variables, the statistical approach and limitations of this study. Chapter 4 reported the results of this study and provided tables reflecting the Pearson $\chi^2$, Mann-Whitney U and logistic regression tests. Chapter 5 listed the summary of the study problem and methodology, respondents’ demographic characteristics, conclusions and discussion, limitations and recommendations. The results of this study will be communicated to the Hispanic population as a lead poisoning prevention campaign in partnership with the print, radio
and television media, the Hispanic faith community and through small group presentation
at community centers or at facilities where the study's data was collected. A culturally
sensitive lead poison prevention communications campaign is essential to helping this
population understand its role in rearing healthy children who are not exposed to lead.
CHAPTER 2
REVIEW OF RELATED LITERATURE

Lead Exposure Trends in the United States

Childhood lead poisoning continues to be one of the most important health issues in the United States today. It is a serious illness with potential lifelong negative health effects for children in all socioeconomic strata, but it disproportionately affects poor and minority children. Although childhood lead exposure has declined in the past thirty plus years, the problem is very serious in many communities. The latest estimates from the CDC's National Health and Nutrition Examination Survey (NHANES) conducted during the 1999-2002 period show 310,000 children (1.6%) aged 1 to 5 years of age were found to have elevated BLLs $\geq 10$ micrograms per deciliter ($\mu g/dL$) (considered the level of public concern) and another 1.4 million children in the same age group had BLLs of 5-9 $\mu g/dL$ (CDC, 2005a).

The 1999-2002 NHANES survey (CDC, 2005a) further revealed the impact of lead on poor and minority children. Non-Hispanic blacks and Mexican Americans (for both sexes aged greater than 1 year) had higher percentages of elevated BLLs (1.4% and 1.5%, respectively), compared to non-Hispanic whites (0.5%). That trend continued for male children between 1 to 5 years of age for non-Hispanic blacks (2.5%) and Mexican Americans (3.2%) compared to non-Hispanic whites (1.4%). Females of the same age group had a 3.7% of elevated BLLs for non-Hispanic blacks, 0.8% for Mexican American and 0.3% for non-Hispanic whites. Non-Hispanic blacks had a geometric mean BLL of 2.8 $\mu g/dL$ as compared with Mexican Americans (BLL of 1.9 $\mu g/dL$) and non-Hispanic whites (BLL of 1.8 $\mu g/dL$). Children enrolled in Medicaid aged 1 to 5 years
experienced a higher geometric mean BLL of 2.5 μg/dL than children not enrolled in the program (1.9 μg/dL).

In a study of NHANES III (1988-1994) data, Brody et al. (1994) reported 1% of 1-2 year old Mexican-American children had greater than 25 μg/dL BLL, which was twice the prevalence for non-Hispanic whites. The same NHANES study data revealed that 28% of Mexican American children had BLLs greater than 5 μg/dL compared with 19% of non-Hispanic white children (Bernard & McGeehin, 2003).

A comparison of two survey periods, 1976-1980 (when NHANES II, the second national survey was taken) to NHANES III, Phase II, 1991-1994, shows a decrease in the estimated prevalence rate for all populations and subpopulations from 88.2% to 8.9% (CDC, 1994 and 2005a; Pirkle et al., 1994; Muntner, He, Vupputuri, Coresh & Batuman, 2003; Brody et al., 1994). These percentages translate from an estimated 13,500,000 children with BLLs ≥10 μg/dL to 1,700,000. This large reduction in children’s BLLs has been effected through successful legislation and governmental regulations and policies that removed lead from gasoline, residential lead-based paint products and lead soldering in food, soft-drink cans, water distribution systems and plumbing supplies (U.S. Department of Housing & Urban Development (HUD), 2010a; Pirkle et al., 1994; CDC, 1991).

The decline in the estimated prevalence rate has been impacted by a coordinated lead prevention effort among the Centers for Disease Control (CDC), U.S. Departments of Housing and Urban Development (HUD) and the Environmental Protection Agency (EPA) and other regulatory agencies (HUD, 2010a; CDC, 2005b). Collaboration among
these federal agencies has produced common standards, helping to narrow collection of national data and coordination of common goals and objectives on lead.

The CDC, HUD and EPA offer grants to address the childhood lead poisoning issue. The CDC (1991, 2005b; Jacobs et al., 2002) and HUD (2005) began to require grantees to develop formal plans to eliminate lead poisoning in their jurisdictions, to coordinate among state, local and non-governmental organizations, to link BLL surveillance and Medicaid claims data to identify gaps in screening of high-risk populations. The collaboration also helped to eliminate lead paint hazards in pre-1978 housing. HUD distributed over $700 million in grants during fiscal years 1992-2002 for residential lead control in low-income, privately owned housing through the Lead-Based Paint Hazard Control Grant Program (HUD, 2005). The HUD grants had a major impact in reducing the number of U.S. homes with lead-based paint from an estimated 64 million to 38 million from 1990 to 2000 (Jacobs et al., 2002).

Between 2007 and 2009, EPA (2010a) made available more than $7.7 million to tackle the lead problem through its National Community-Based Lead Outreach and Training Grant Program ($2 million), the Tribal Grants ($500,000) and the Targeted Lead Grant Program ($5.2 million). The Targeted Lead Grant program funded more than $5.2 in grants in 2007 for projects in areas with high incidences of children with elevated blood-lead levels in vulnerable populations. These targeted grants are intended to address immediate needs of the communities in which they are awarded, and will also highlight lead poison prevention strategies that can be used in similar communities across the country. That year, the University of Nevada was selected as one of the organizations to
receive a targeted lead grant, whose title is *Screening Imported Candy to Identify Lead Contamination Hazards* (EPA, 2010a).

The CDC has linked to other federal agencies in developing a systematic and coordinated response to identify and eliminate non-paint sources of exposure (e.g., lead jewelry, food and folk medicines, and cosmetics). National data continues to be collected by the CDC’s NHANES surveys and child lead test results surveillance data from states and local entities to monitor the scope of the lead problem.

**National Surveys**

Since the 1960s, the extent of human lead exposure has been assessed in the United States by using NHANES, a series of cross-sectional, nationally representative examination surveys conducted by the CDC’s National Center for Health Statistics (CDC, 1982, 2003). NHANES data indicate distribution of BLLs among the national population but do not reflect the lead burden at the state or local level. The survey examines a nationally representative sample of about 5,000 persons each year. These persons are located in counties across the country, 15 of which are visited each year. The NHANES surveys include a household interview and a standardized physical examination conducted in a mobile examination center. CDC has conducted NHANES I (1971-1975), NHANES II (1976-1980), NHANES III, Phase I (1988-1991), NHANES III, Phase II (1991-1994), and NHANES IV (1999-2000), and additional surveys for years 2001-2002, 2003-2004 and 2005-2006. Since 1999, the survey has become a continuous program that changes focus on a variety of health and nutrition measurements according to emerging needs.
The CDC receives state and local surveillance data to determine the burden of elevated BBLs among young children in the United States (CDC, 1993a). NHANES reports data on children from 1 – 5 years old, while the states and local surveillance data report on the results of blood lead tests of children under 6 years. Differences in data collection processes and age of subjects make data from these two methods difficult to compare. The CDC’s state surveillance reports from 1997-2001 (Meyer et al., 2003; CDC, 2003) which were analyzed with results from the NHANES IV (1999-2000) survey, demonstrate that policies, legislations and regulations are continuing to effect a decline in BLLs across the United States.

Previous health and nutrition examinations have included responses from a limited number of Mexican-Americans and no specific data for Puerto Ricans or Cuban Americans. The number of NHANE surveys collected from the Mexican-American populations have not been sufficient to produce estimates of the health of Hispanics in general. In 1982-1984, the CDC conducted the Hispanic Health and Nutrition Examination Survey (HHANES), a population survey to assess the health and nutritional status and needs of Hispanics in selected geographic areas of the United States. The survey collected data from three Hispanic subgroups of the population, including Mexican Americans residing in five southwestern states (Arizona, California, Colorado, New Mexico and Texas); Cubans in Dade County, Florida; and Puerto Ricans residing in the New York metropolitan area and parts of the state, in New Jersey and Connecticut (Delgado, Johnson, Roy & Treviño, 1990).

The HHANES surveyed Hispanics about chronic conditions, nutritional status, food consumption patterns, alcohol consumption, dental health and digestive diseases.
Respondents answered questions about environmental exposure to lead and selected pesticides (Delgado et al., 1990; HHS, 1985). This data revealed differences in BLLs among the Mexican-Americans, Puerto Rican and Cuban children and disparities between the Hispanic and white children (Carter-Pokras, Pirkle, Chavez & Gunter, 1990). Since the HHANES was a one-time survey in geographic areas of the country, survey results only apply to the subgroups within the geographic areas. Data from this survey did not provide national estimates and cannot be used to generalized about the national Hispanic population. Without national data, it is difficult to assess the state of health and the lead burden of the national Hispanic community.

**Lead Exposure**

Lead exposure is calculated by measuring levels of the toxic substance in the blood or micrograms per deciliter (µg/dL). The definition of the level of lead exposure where clinical toxicity occurs – childhood lead poisoning – has evolved over the century (Silbergeld, 1997; CDC, 1991, 1997, 2003, 2005b, 2007, 2010b). Medical and public health opinion also changed about the level of lead that affects children's health. In 1960, the CDC’s level of concern was ≥60 µg/dL. Many children were being exposed to BLLs ≥60 µg/dL, which caused encephalopathy (brain damage), coma, convulsions, severe abdominal spasms, kidney injury and anemia. That level changed to ≥30 µg/dL in 1975 then dropped to ≥25 µg/dL in 1985. In 1991, the CDC once again reduced the level to ≥10 µg/dL and called for virtually universal screening of children 1-6 years of age when it issued its statement on Preventing Lead Poisoning in Young Children. The CDC’s virtually universal blood lead screening policy required screening except in
communities where large numbers or percentages of children have been screened and found not to have lead poisoning.

In 1997, the CDC modified its screening guidelines as a result of dramatic improvements in reducing lead in the environment and new information about how lead exposure occurs in predictable patterns throughout the U.S. The new screening guidelines allowed communities with lower prevalence of elevated BLLs to use other strategies considered more efficient and effective at improving children's health and development. State/local health officials were given more freedom to examine local conditions and develop a screening plan to target children from low-income families who lived in older homes—two variables highly associated with lead exposure. Results reported by Briss, Matte, Schwartz, Rosenblum and Binder (1997) showed economic benefits of universal screening decreased when less than 14% of children had EBLLs. Current prevalence rates for children with EBLLS for the U.S. are very low, except for inner-city pockets where older housing and low-income families live. The new CDC screening guidelines and data from Briss et al.'s study demonstrate other strategies may be needed to target EBLLs in urban communities.

In the 2005 statement on lead poisoning, the CDC (2005) and its Advisory Committee on Childhood Lead Poisoning Prevention reaffirmed the public action level at $\geq 10 \mu g/dL$. Endorsements of this public action level were received from the National Academy of Sciences, the American Academy of Pediatrics and the World Health Organization (Ferber, 2002; WHO, 1995; AAP, 2005). The CDC continues to emphasize primary prevention efforts as the best method to prevent exposure of lead to our most vulnerable populations.
A threshold value below which lead has no apparent adverse developmental effect has not been recognized (Bellinger, 1995, 2004; Lanphear, Wright, & Dietrich, 2005c; Landrigan, 2000). Although the CDC’s screening action guideline set at BLLs $\geq 10$ µg/dL was intended as a risk guidance and management tool at the community level, it has been misinterpreted as a threshold (CDC, 2005b). BLLs higher than $\geq 10$ µg/dL are viewed as toxic, while those below are considered safe (Bellinger, 2004; Silbergeld, 1997; CDC, 1991; CDC, 2005b). The CDC has recommended federal agencies discontinue using the BLLs of $\geq 10$ µg/dL as a regulatory standard for federal agencies or toxicologic threshold (safe blood lead level) for children.

**How Much Lead is Too Much?**

Concepts relating to the treatment of lead poisoning have profoundly changed over the years. Prior to the 1940s, it was generally believed acute poisoning caused death or the neurologic manifestations of lead poisoning would subside without serious consequences once the source of the toxicity (i.e., leaded paint chips, etc.) was removed from the child’s environment (Landrigan, 2000; Needleman, 1990, 2004a, 2004b; Silbergeld, 1997). In 1943, Randolph Byers, Chief of Pediatric Neurology at the Boston Children’s Hospital, studied 20 children who had recovered from lead poisoning and found 19 of the 20 had learning or behavior disorders, suffering from mental retardation and recurrent seizures. Findings from this study advanced the neurotoxicologic theory by disputing beliefs on the effects of lead poisoning—lead did not simply kill cells but also interfered with the normal development of the child’s central nervous system (Byers & Lord, 1943; Perlstein & Attala, 1966; Needleman, 2004a, 2004b).
Byers’ results have been reconfirmed by a large body of experimental and human data, showing the persistent and damaging effects of BLLs \( \geq 10 \mu g/dL \) on brain function, including lowered intelligence, behavioral problems and diminished school performance (Bellinger et al., 1992; Bellinger, 1995, 2004; Bellinger & Bellinger, 2006; Baghurst et al., 1992; Dietrich, Berger, Succop, et al., 1993; Needleman & Gatsonis, 1990; Wasserman et al., 1997; Needleman, 2004a, 2004b; Pocock, Smith & Baghurst, 1994). A highly significant association between lead exposure and children's Intelligence Quotient (IQ) was also shown by Schwartz (1994b) in a meta-analysis of studies examining the relationship in school age children between blood lead and IQ. The meta-analysis revealed an increase in BLLs from 10 to 20 \( \mu g/dL \) was associated with a decrease of 2.6 IQ points.

There is emerging evidence revealing lead-associated intellectual deficits occur at BLLs \(< 10 \mu g/dL\) (Bellinger, 2000; Bellinger & Dietrich, 1994; Bellinger et al., 1991; Bellinger et al., 1992; Dietrich, Krafft, Bornschein, et al., 1987; Dietrich, Berger, Succop, et al., 1993; Leviton et al., 1993; Landrigan, 1989, 2000; Mushak, Davis, Crocetti & Grant, 1989; Needleman, 2004a, 2004b; Needleman & Gatsonis, 1990; Needleman et al., 1990). Various researchers support a reduction in the CDC’s action level of \( \geq 10 \mu g/dL\). In a study of the 2000 issue of Public Health Reports, Lanphear and colleagues reported lead may be toxic at BLLs lower than 5.0 \( \mu g/dL \). Their study analyzed data from more than 4,800 children ages 6 to 16 years who participated in the NHANES III Phase II (1988-1994). An inverse relationship between blood lead and math and reading scores was noted in children at BLLs \(< 5 \mu g/dL\). Each time blood lead concentration increased by 1 \( \mu g/dL\), there was a 0.7-point decrement in mean arithmetic scores, and
approximately 1-point decrement in mean reading scores, a 0.1 - 0.5-point decrement in mean scores on a measure of nonverbal reasoning, and a 0.5-point decrement in mean scores on a measure of short-term memory. The relationship was still evident after adjustment of an extensive series of potential confounding factors (i.e., IQ relationship, such as parenting skills and parental intelligence).

In the Rochester Longitudinal Study, Canfield et al. (2003) showed an estimated reduction of 7.4 IQ points associated with an increase in lifetime mean blood lead from 1 to 10 µg/dL. Bellinger and Needleman (2003) reported a similar reduction for children whose maximal BLL was < 10 µg/dL. Lanphear, Hornung, Koury, et al. (2005b) subsequently examined data collected from 1,333 children who participated in seven international population-based longitudinal cohort studies, followed from birth or infancy until 5-10 years of age. This study found an inverse relationship between blood lead concentration and IQ score. The researchers concluded environmental lead exposure in children who have maximal BLL < 7.5 µg/dL is associated with intellectual deficits.

In contrast, researchers such as Kaufman (2001), Hebben (2001) and Bernard (2003), and Brown and Rhoads (2008) dispute the need to lower the current action level of 10 µg/dL. Kaufman argues that parental IQ variables, such as parental intelligence, parental skills and maternal smoking during pregnancy are more important to a child’s cognitive development than the effect of low-level lead exposure. Mis-measurement of these confounding variables can strengthen or weaken the estimated association between lead exposure and child intelligence. Kaufman is not convinced low lead exposure may cause a loss of a few IQ points and places little value in that claim (Kaufman, 2001; Needleman & Bellinger, 2001). Hebben and Bernard support Kaufman’s recommendations the data
be more critically reviewed to assess if low-level lead exposures cause changes in IQ scores in children. They concur with Kaufman’s warnings for professionals to use greater care when drawing conclusions from neuropsychological test deficits. These deficits are being attributed to low-level lead exposure when other (confounding) variables could influence the results. Bernard points to previous studies (Bellinger et al., 1992; Tong, McMichael & Baghurst, 2000; Tong & Lu, 2000) in which socioeconomic status, maternal intelligence, parents' smoking behavior and the quality of a child’s home environment (i.e., using the Home Observation for Measurement of the Environment inventory—HOME) are shown to have added impact on a child’s cognitive development. Rather than lowering the action level as some researchers support, Bernard recommends modifying existing guidelines, such as having infants aged 1 year or younger with BLLs of 5 µg/dL or higher be screened within 3 to 6 months (instead of waiting 12 months). He also believes in providing universal lead poison prevention education to parents/guardians and increasing the participation of pediatricians and public health workers in identifying and reducing exposures of children discovered to have elevated BLLs.

In a 2008 Environmental Health Perspectives Guest Editorial article, Brown and Rhoads claimed available evidence does not warrant change in the CDC’s action level and assert children with BLLs < 10 µg/dL should not be considered lead poisoned as the term is used in the clinical setting (CDC, 2005a). Brown (the CDC Chief of Lead Poisoning Prevention Branch) and Rhoads (the Chair of the Advisory Committee on Childhood Lead Poisoning Prevention) conclude the CDC has not found feasible or effective interventions to reduce BLLs in this range, a threshold has not been identified
for adverse effects and current laboratory methods are not able to handle levels lower than the 10 µg/dL with precision and validity each time. These authors support the CDC's recommendation for using a multi-tiered approach, requiring case management of children with BLLs ≥10 µg/dL, which is partnered with increased primary prevention efforts that control and eliminate lead in children’s environments.

Questions still remain regarding the outcome of low-level lead exposure on children. Sophisticated statistical analyses on the effects of BLLs lower than 10 µg/dL on the child’s cognitive development are needed with improved research strategies and with larger samples that better control confounding variables. One fact is known; however, lead is an ubiquitous element that continues to affect thousands of children in our nation.

Routes of Exposure and Effects

For the general population, exposure to lead occurs primarily via the oral route, with some contribution from the inhalation route. Occupational exposure is primarily by inhalation with some contribution by the oral route (ATSDR, 2007). In children, the most common exposure pathways are inhaling or ingesting lead-contaminated dust, ingesting lead-based paint chips and ingesting lead-contaminated soil. Children's young stomachs and central nervous systems are five- to tenfold more efficient at absorbing lead taken orally than adults (ATSDR, 2007; Needleman, 2004a; CDC, 1991). The children's BLLs are generally highest between 9 and 18 months of age, because of their desire to explore the environment via hand-to-mouth activity (Annest et al., 1983; Brody et al., 1994; Calabrese, Stanek, James & Roberts, 1997; CDC, 1991, 2002b, 2005b). Boys have slightly higher BLLs than girls, which is thought to be related to their more active and frequent exploratory behaviors in early childhood.
Toxic effects of lead are the same regardless of route of exposure (ATSDR, 2007). The dose data for humans are generally expressed in terms of absorbed dose or concentration of lead in the blood (PbB). For this paper, lead in the blood is expressed as blood lead level (BLL). The concentration of lead in blood reflects mainly the exposure history of the previous one or two months. Once lead enters the body, it travels through the bloodstream and deposits into organ tissues (Barry & Mossman, 1970; Barry, 1975; Rabinowitz, 1998; Rabinowitz, Wetherill & Kopple, 1974). Lead is highly toxic to multiple organ systems, including the central and peripheral nervous systems, the cardiovascular system, the kidney and the reproductive system of males and females (Needleman, 2004a; Silbergeld, 1997; Bellinger, 2004; CDC, 1991, 1995).

Because lead poisoning often occurs with no obvious symptoms, it frequently goes unrecognized. At lower levels, lead exposure can cause learning disabilities, behavioral problems. Patients with high BLLs may experience severe, intractable colic, motor clumsiness, clouded consciousness, weakness and paralysis, seizures, coma, and even death (CDC, 2002b, 2005b; Needleman, 1990, 1998, 2004; Needleman & Bellinger, 2001; Bellinger, 1995, 2000, 2004a, 2004b; Bellinger & Needleman, 2003). High levels of lead exposure for males and females has been associated with hypertension (Cheng et al., 2000; Hu et al., 1996; Rothenberg, Kondrashow, Manalo et al., 2002; Loghman-Adham, 1997; Rastogi, 2008), with renal failure (Scharer, Veits, Brockhaus and Ewers, 1991; Wedeen, 1988; Loghman-Adham, 1997; Rastogi, 2008) and chronic kidney disease (Muntner et al., 2003; Loghman-Adham, 1997; Rastogi, 2008). At the molecular level, lead can substitute for calcium and other essential trace elements to interfere with
the molecular biology of the cell at the level of DNA integrity (Silbergeld, 1997; Goyer, 1995; Ballatori, 2002; Bridges & Zalups, 2005).

Epidemiologic studies have shown the skeleton contains about 90% of the lead body burden in adults and 70% in children (ATSDR, 2007; Barry & Mossman, 1970; Barry, 1975; Steenhout, 1982; Hernandez-Avila et al., 1998). Lead in bone is considered a biomarker of cumulative or long-term exposure to lead, because lead accumulates over the lifetime, and most of the lead body burden resides in bone. For this reason, bone lead, rather than blood lead, may be a better predictor of some health effects (ATSDR, 2007; Silbergeld, 1991; Rabinowitz, 1998; Rabinowitz et al., 1974; Wedeen, 1988; Scharer et al., 1991; Steenhout & Pourtois, 1980). Lead is not changed into any other form once it enters the body. Whatever is not stored in the organs or bones is excreted through urine or feces. Adults can excrete about 99% of the amount of lead taken into the body, while the body of a child can only excrete about 32% of the lead (ATSDR, 2007).

Although lead can stay in the bones for decades, mobilization of lead (i.e., where lead leaves the bone to reenter the blood and organs) can occur during periods of altered mineral (i.e., calcium-related changes) in metabolism (Silbergeld, 1991; Gulson, Jameson, Mahaffey et al., 1997; Gulson, Mizon, Korsch et al., 2002; Rothenberg, Khan, Manalo et al., 2000). During pregnancy and lactation, there is an increase in maternal blood volume and a higher level of calcium is provided from other body processes to meet this demand. Since lead crosses the placental barrier, it can pose a threat to the unborn baby (Erdem et al., 2004; Silbergeld, 1991). Prenatal exposure to lead has been associated with adverse effects on early childhood growth, hearing and cognitive development (Dietrich, Krafft, Bornschein, et al., 1987; Dietrich, Berger, Succop, et al.,
1993; Leviton et al., 1993). Accumulating evidence indicates women taking significant doses of calcium have lowered BLLs during pregnancy and lactation (Faria et al., 1996; Hernandez-Avila et al., 1996; Ettinger et al., 2007).

Although an effective treatment to eliminate lead from the body has not been identified, the CDC (2010c) lists chelation therapy as a method of treatment to use with caution in the medical management of children with BLLs > 45 µg/dL. Dimercaprol, edetate calcium disodium (calcium EDTA) and succimer are the three agents primarily used for chelation (AAP, 1995; CDC, 2010c). Chelation therapy uses chemicals/drugs to bind the lead in the bloodstream, causing the bound lead to be flushed from the body in urine and bile more rapidly than would happen naturally. The TLC Trial Group (2000) showed a course of chelation therapy with succimer results in a rapid fall in BLL after one week of treatment. BLLs of individuals in this therapy rebounded after treatment ended, and by approximately seven weeks after an initial course of therapy, BLLs of treated patients reached almost 75% of pre-chelation levels (possibly because of lead released from storage sites). The mean BLL of the succimer group was 4.5 µg/dL lower than that of the placebo group during the six-month period after initiation of treatment. The placebo group had a gradual decline in average BLL.

Chelation for children with blood lead concentrations of < 45 µg/dL remains controversial, especially with two studies failing to demonstrate a change in cognitive outcomes with succimer therapy. Rogan et al., (2001) found that treatment with succimer lowered BLLs but did not improve scores on cognition, behavior or neuropsychological function in children with BLLs below 45 µg/dL. Dietrich, Ware, Salganik, et al., (2004) also found chelation therapy with succimer lowered average BLLs for approximately six
months but resulted in no benefit in cognitive, behavioral and neuromotor endpoints in children with BLLs between 20 and 44 µg/dL.

Chelation therapy continues to be a method of last resort to use in the most serious cases of blood lead poisoning (> than 45 µg/dL). Primary prevention, or early identification and removal of the lead source to prevent further exposure is the most effective intervention for lead toxicity.

How Lead is Introduced in the Environment

Lead is a metal found naturally in the earth’s crust, usually combined with two or more elements to form lead compounds (ATSDR, 2007). Metallic lead resists corrosion; it is not easily attacked by air or water. Much of the lead comes from human activities, including burning fossil fuels, mining, and manufacturing. These industries have utilized lead for pipes, storage batteries, weights, shot and ammunition, cable covers and sheets made to shield us from radiation (ATSDR, 2007). When added to paint, lead makes colors brighter and paint last longer. Lead compounds are also used as a pigment in dyes and ceramic glazes and in caulk. When lead was added to gasoline, it enhanced motor performance.

Gasoline Additive

Tetraethyl lead and tetramethyl lead were used in 1925 through 1996 as a gasoline additive to increase octane rating and reduce the ping (ATSDR, 2007; CDC, 1991). The additives prompted the automobile industry to develop the high-power, high-compression internal combustion engines, which helped win World War II and dominate the models offered until the early 1970s (Silbergeld, 1997; Rosner & Markowitz, 1985; Markowitz & Rosner, 2000). In 1925, when tetraethyl lead (TEL) was first produced as a gasoline
additive, workers at all three operating plants began to die. After a brief moratorium imposed by the Surgeon General, production of the additive resumed and continued until the 1980s. Noted industrial hygienist Alice Hamilton and others classified this additive as a neurotoxin. Their opposition to its use did little to stop production (Rosner & Markowitz, 1985; Markowitz & Rosner, 2000).

Environmental levels of lead have increased more than 1,000-fold over the past three centuries as a result of human activity (ATSDR, 2007). The greatest increase occurred between 1950 and 2000, reflecting the worldwide use of leaded gasoline. Most of the lead released into the U.S. environment came from vehicle exhaust prior to the banning of leaded gasoline. Lead being released into the air from cars in the United States totaled 94.6 million kilograms (208.1 million pounds) in 1979. Ten years later, when the use of lead was limited but not banned, cars released only 2.2 million kilograms (4.8 million pounds) to the air. The amount of lead released into the air has decreased further with regulations from the Environmental Protection Agency (EPA) banning the use of leaded gasoline for highway transportation in 1996 (EPA, 1996a; ATSDR, 2007).

The effects of lead released into the air from leaded gasoline continue to be evident in older urban sites throughout the nation. These inner-city neighborhoods are congested with older housing, high volumes of automotive traffic and vehicular exhaust. Lead airborne particles, and paint chips and dust from leaded paint found in the older housing increase the risk of exposure for children in these communities (Rabin, 1989; Mielke et al, 1983; Weitzman, 1993; Aschengrau, Beiser, Bellinger, Copoehafer & Weitzman, 1994; Mielke et al, 1999; Needleman, 1990; Mushak & Crocetti, 1989, 1990; Lanphear, Matte, Rogers, et al., 1998b; Lanphear, Weitzman, Winter, et al., 1996; Lanphear, Byrd,
Auinger, et al., 1998a). Low-income Hispanic families living in inner-city Las Vegas neighborhoods face similar risks of being exposed to environmental toxicants, especially from housing that is 40 to 50 years old with chipping or peeling leaded paint and leaded dust.

**Leaded Paint, House Dust and Soil**

From the 1800s to 1978, lead was introduced in millions of housing structures as a component of most paints. House paint used before 1950 contained up to 50% lead by weight. The national Lead-Based Paint Poisoning Prevention Act (LBPPPA) was introduced in 1971 and later amended in 1973 (HUD, 2010a). The LBPPPA primarily addressed lead-based paint in federally-funded housing and established definitions for lead-based paint and lead poisoning. The legislation focused on taking action when a lead-poisoned child was identified and required the testing and treating of chewable surfaces, such as fixtures, window sills and door frames. In 1987 through 1988 significant amendments to this legislation were made between, followed by introduction of Title X of the Housing and Community Development Act of 1992. Title X represented a new strategy to reduce lead based paint hazards, by focusing on prevention and removal of hazards before children became exposed to lead. Title X required several federal agencies to establish new standards and requirements to aid in identifying and reducing lead-based paint hazards.

In 1978 the Consumer Product Safety Commission (CPSC) banned the residential use of lead-based paint and lowered the legal lead content in most paints from 0.5 to .06% by weight (HUD, 2000, 2010a; CDC, 2004; CPSC, 1978a, 1978b). This Act,
administered primarily by HUD, prohibits application of lead-based paint to housing constructed or rehabilitated with federal assistance.

Millions of properties built before 1978 continue to be the most common high-dose source of lead exposure for young children in the United States. Results from a study by Jacobs et al. (2002) indicate 38 million housing units have lead-based paint, down from a 1990 HUD estimate of 64 million. The same study reported 24 million housing units had significant lead-based paint hazards. Low-income families (<$30,000/year) with children under 6 years of age lived in 1.2 million units classified with significant lead-based paint hazards. Hazards were present in 35% of all low-income housing and 17% of government-supported, low-income housing. For households with incomes ≥ $30,000, the study found 19% had hazards. Significantly deteriorated lead-based paint affected 14% of all houses. Dust and soil lead levels were above current standards set by the HUD and the U.S. Environmental Protection Agency (EPA). Housing units in the Northeast and Midwest, compared to housing units in the South and West, had twice the prevalence of hazards.

Dust lead is the strongest predictor of childhood BLLs (Lanphear, Byrd, Auinger, et al., 1998a; Lanphear, 2005; HUD, 2005; Gaitens et al., 2009). Lanphear, Hornung & Ho (2005a) showed housing characteristics (i.e., rental status, housing condition) and floor dust lead levels were associated to BLLs ≥ 10 µg/dL. Their analyses of two existing studies found residential floor lead levels considerably lower than the EPA standard (40 µg/ft²) were associated with a large increase in the proportion of children with a blood lead concentration ≥ 10 µg/dL (EPA, 2009; HUD, 2000; ATSDR, 2007). Children who were exposed to floor lead levels 5 µg/ft² -10 µg/ft² were at 3.5-fold greater risk for
having a BLL $\geq 10$ µg/dL compared to children whose exposure to floor lead levels were below 2.5 µg/ft² (the referent group). The higher the floor dust lead levels, the greater the risk of having an increase in EBLLs. When floor dust lead levels were between 15 to 25µg/ft², there was a 4.1-fold greater risk of increased EBLLs. When dust lead levels were $>25$µg/ft², the risk for EBLLs was 8.7-fold as compared to the referent group whose exposure to floor lead levels was below 2.5 µg/ft².

Dixon et al. (2009) further studied how floor dust lead loadings and other housing factors influence BLLs in children. Their models predicted the probability for a BLL $\geq 10$ µg/dL to be between 2.7 and 7.9% when floor lead dust level is 12 µg/ft². The study revealed the odds of having a BLL $\geq 5$ µg/dL were more than three times higher for children living in pre-1950 housing with renovation or for children living in pre-1950 housing with deteriorated paint inside than children living in other homes. This and other epidemiological studies (Lanphear, Hornung & Ho, 2005a; Lanphear, Matte, Rogers, et al., 1998b, Lanphear, Weitzman, Winter, et al., 1996; Malcoe, Lynch, Kegler, & Skaggs, 2002) were cited by the members of the EPA’s Clean Air Scientific Advisory Committee (CASAC) during their 2007 peer review meetings of two EPA’s draft documents, including the Draft Final Report on Characterization of Dust Lead Levels After Renovation, Repair and Painting Activities. CASAC members recommended to reduce the residual surface contamination standards, also known as dust lead cleanup levels of 40 µg/ft² for floors and 250 µg/ft² for window sills in order to protect the children's health.

According to Mushak and Crocetti (1989), exposure to leaded dust and leaded soil may occur simultaneously. Lead in soil is related to airborne lead from leaded gasoline, because lead in the air settles onto soil. Increased levels of lead in soil can be found in well-traveled
roads and highways, even though leaded gas was banned in 1996. Paint chips and dust from leaded paint contribute lead in the soil (Rabin, 1989; Mushak & Crocetti, 1989). Lead from the air, paint chips and dust from paint create higher levels of lead contaminated soil in inner city communities (Mielke et al., 1983; Mielke et al., 1999; Weitzman, 1993; Aschengrau et al. 1994). In their study, Mielke and Reagan (1998) found soil lead and house dust, not lead-based paint, are the best indicators of potential lead exposure (i.e., as opposed to age of housing). Soil lead and house dust integrate exposure from various sources, such as lead-based paints, lead-based gasoline, and other wastes. Lead-based paint dust is associated with interior or exterior renovation of the housing structures. There is also a strong correlation between child BLLs and the time spent outdoors (BINNS, LeBailly, Fingar, & Saunders, 1999; Binns et al., 2004). Children are especially at risk because much of the lead exposure from the soil is through pica behavior (i.e., hand-to-mouth contact). Not only is lead found in soil, but in areas where housing contains old plumbing fixtures, children may risk exposure to lead in water.

**Lead in the Water**

In the 1980s as the levels of medical concern for lead exposures were decreased, it became apparent that drinking water could be a source of increased lead exposures, especially from the use of lead in many parts of the water distribution system, plumbing fixtures and in housing or building construction materials. To ensure the safety of the water supply in the country, the Safe Drinking Water Act of 1974 with amendments in 1986, 1988 and 1996, restricted the use of lead (no more than 8%) in pipes, solder and other plumbing components (CRS, 2003). When amended in 1996, the Act retained the 8% lead content requirement and further mandated faucets, drinking fountains and other drinking water dispensing devices to meet higher performance-based lead leaching requirements. The Safe
Drinking Water Act made it unlawful to sell pipes or plumbing fittings or fixtures that were not "lead free." Lead from solder is most commonly found in homes built between 1970 and 1985. The amount of lead in water depends on the types and amounts of minerals in the water, how long the water stays in the pipes, the water’s acidity, and its temperature. Lead may leach into the water when there are lead or copper pipes, fixtures or fittings made with brass, bronze or other alloys, lead solder on the pipes and the water is acidic (i.e., soft). "Softness" usually refers to the absence/presence of specific ions such as calcium (Ca++) and magnesium (Mg++). The fewer mineral ions, the more acidic the water. Acidic water may leach lead from sources, such as pipes or fittings. The campaign to reduce lead in these items has been ongoing as the dangers of lead have become more recognizable.

**Occupational/Non-Occupational Sources**

Since 1994, CDC's state-based Adult Blood Lead Epidemiology and Surveillance (ABLES) program has tracked laboratory-reported BLLs in U.S. adults (CDC, 2006b, 2009a). Adults are considered to have elevated BLLs at rate of ≥25 µg/dL. Data were provided by 37 states in 2005, 38 states in 2006 and 38 states in 2007. A decline in the national overall rates of elevated BLLs was shown from 1994 to 2007 from 14.0 per 100,000 employed adults to 7.8 per 100,000. During these three years, ABLES states reported 8,902, 9,562 and 9,871 state resident adults with elevated BLLs in 2005, 2006 and 2007. The national rate per 100,000 state resident adults with elevated BLLs declined 4%, from 7.5 in 2004 to 7.2 in 2005, but increased 3% from 7.2 in 2005 to 7.4 in 2006 and 2007. State annual prevalence for the three years varied by state. Prevalence rates in 2007 were <10 per 100,000 in 29 states and ≥20 per 100,000 in six states (CDC, 2009).
Data on industry and exposure sources for the same time period were submitted by 33 states (7,492 state resident adults) in 2005, 35 states (8,230 state resident adults) in 2006, and 35 states (8,246 state resident adults) in 2007 (CDC, 2009). For this analysis, adults exposed to both occupational and non-occupational sources (17 in 2005, 24 in 2006, and 11 in 2007) were considered exposed at work only. Work exposures accounted for 5,861 (78.2%), 6,643 (80.7%), and 6,463 (76.7%) elevated BLLs in 2005, 2006, and 2007, respectively.

Three large industry sectors employed the majority of adults with elevated BLLs: manufacturing (64.8% in 2005 and 71.8% in 2006 and 2007), construction (15.2% in 2005, 12.6% in 2006, and 11.4% in 2007), and mining (9.4% in 2005, 9.5% in 2006, and 10.5% in 2007). Industry subsectors with the highest numbers were manufacturing of storage batteries, mining of lead and zinc ores, and painting and paper hanging.

Lead exposures from occupational and non-occupational methods can place family members at risk of lead poisoning by what is commonly called "take home" lead dust. This dust is collected on clothing, hair, shoes and skin of a person whose occupation or hobby deals with lead. Hobbies using lead include the making of ceramics, stained glass, bullets, and fishing weights, furniture refinishing, home remodeling, painting and target shooting at firing ranges. From 2005 to 2007, non-occupational exposures accounted for 330 (4.4%), 380 (4.6%), and 350 (4.2%) adults in 2005, 2006, and 2007, respectively. The most common exposures were shooting firearms, remodeling, renovating, or painting, retained bullets (gunshot wounds) and eating food containing lead (CDC, 2009a). Members of ethnic populations may come in contact with lead through eating cultural foods, such as those sold in cans at special markets.
Leaded Soldering of Cans

According to a 1988 ATSDR report, the Federal Drug Administration (FDA) estimated about 20% of all dietary lead came from canned food, primarily from lead solder in cans. FDA achieved reductions of about 80-90% in the lead content of infant foods, primarily through the elimination of the use of cans for infant food products and following good manufacturing practices. The FDA banned lead soldered cans in 1995 after the U.S. Canned Foods Industry voluntarily decreased the use of this type of packaging. In 1996, food in lead soldered cans was banned from shelves of U.S. groceries (FDA, n.d).

Although lead soldering is no longer used in the processing of canned foods in the U.S., it has been found in imported food products sold at ethnic markets, swap meets or by door-to-door vendors (Romieu et al., 1994; CDC, 1991, 2005a; Kurtzweil, 1997). Many immigrants continue to expose their families to lead unknowingly by purchasing ethnic canned goods that may contain lead soldering. It is difficult to assess how these practices might be affecting the first generation Hispanic immigrant populations nationwide and in Nevada.

The FDA also established standards for dietary supplements, bottled water, and lead foil capsules on wine bottles. Under the Dietary Supplement Health and Education Act of 1994 (DSHEA), the dietary supplement manufacturer is responsible for ensuring that a dietary supplement is safe before it is marketed (FDA, 1994). FDA is responsible for taking action against any unsafe dietary supplement product after it reaches the market. The Federal Food, Drug, and Cosmetic Act (FFDCA) of 1906 provides FDA with broad regulatory authority over food that is introduced or delivered for introduction into
interstate commerce (FDA, 1994). Under the FFDCA, manufacturers are responsible for producing safe, wholesome and truthfully labeled food products, including bottled water products.

In the U.S., the FDA finally officially banned lead foil capsules on domestic and imported wine bottles as of 1996 (FDA, n.d). Lead foil capsules covered the top of wine bottles and were used to protect the corks from being gnawed away by rodent or from being infested by cork weevil. Lead capsules (lead foil bottleneck wrappings) were slowly phased out, and by the 1990s, most capsules were made of tin, heat-shrink plastic (polyenthylene or PVC), or aluminum. These actions have resulted in a considerable decrease in the dietary lead exposure for the general population and vulnerable subpopulations.

Non-Traditional Sources of Lead Through Cultural Practices

**Clay Pottery and Vessels**

Various environmental sources related to cultural practices have been identified as culprits in exposing children to lead: imported handmade or glazed ceramic dishes and pottery, Mexican candies, folk (home) remedies, pewter key chains and bathtub tiles. Lead has also been found in leaded crystal, pewter and brass dishware (CDC, 2002; Baer et al., 1998; Mohamed, Chin & Pok, 1995; Rothweiler et al., 2007; Gorospe & Gerstenberger, 2008; Cabb et al., 2008). Clay items, whose glaze has been improperly fired and which hold acidic substances (i.e., orange juice, tomato sauces, or wine, etc.), have been shown to interact chemically with the glaze. This interaction accelerates lead release (Schnaas et al., 2004); Mindling, 2002; Hernandez-Serrato et al., 2003). Recent data from the Arizona Department of Health Services (2005) implicated pottery, folk
remedies and toys as lead poisoning sources for children with BLLs ≥ 20 µg/dL or with persistent BLLs of 15 to 19 µg/dL.

In Mexico, locally made glazed pottery remains a significant source of lead exposure for Mexican children (Romieu et al., 1994; Lopez-Carillo et al., 1996; Meneses-Gonzalez et al., 2003; Mexico’s Secretariat of Health, 2005; Villalobos et al., 2009). Mexicans following cultural practices use clay bean pots in food preparation and clay vessels for hot and cold beverages. Some leaded glazed pottery is imported to the United States for retail to the immigrants living in the U.S. or is brought back one piece at a time by Mexicans returning from a visit at home. This pottery is often used at home or given as gifts (Gersberg, et al., 1997).

Although no baseline national information on BLLs is available, results from seven studies described in a 2005 report from Mexico’s Secretariat of Health indicate some urban and rural populations have very high levels of blood lead—in some cases more than five times the action level of ≥10 µg/dL. In Meneses-Gonzalez et al. (2003), the study of 232 children in the state of Morelos, Mexico, revealed a geometric mean BLL of 6.7 µg/dL with 29.7% of the children with levels over 10 µg/dL. About 66% of mothers who were surveyed in this study reported they used lead glazed pottery for cooking, 36% used it for storing food and 19% used pottery for drinking. In a 1996 study of Mexican children of low socioeconomic status in a suburban area adjacent to Mexico City, Lopez-Carrillo et al. found that 1,987 children (21%) being studied had BLLs between 20 µg/dL and ≥40 µg/dL. The BLLs of children whose mothers habitually cooked or stored foods in lead-glazed pottery were significantly elevated as compared to children whose mothers did not use those items (14.9 vs. 11.7 µg/dL).
Data from a study conducted by Schnaas et al. (2004) revealed children of families using lead-glazed ceramics had BLLs 18.5% higher than did children of families who did not use it. Children from the lowest socioeconomic levels had BLLs 32.2% higher than did children who belonged to the highest economic levels. Use of lead-glazed ceramics to prepare food and being of lower socioeconomic status were found to be the main determinants of BLLs in a study conducted by Hernandez-Avila et al. (1991) in Mexico City. As reported by the researchers, the attributable risk of high BLLs (< 15 µg/dL) for the population from using leaded-glazed ceramics was 58%. Of the 99 women who had blood samples taken, 61 of them who frequently prepared food in leaded-glazed ceramics had BLLs between 12 to 22 µg/dL.

The use of leaded-glazed ceramics was also a major factor in other studies of the Mexican population. Rothenberg, Perez Guerrero, Perroni Hernandez et al. (1990) reported that pregnant women from the Valley of Mexico City who used ceramics and their babies had higher BLLs than women who did not use this type of pottery. In their study on sources of lead exposure in Mexico City, Romieu et al. (1994) found the mean BLL of children living in households using leaded-glazed ceramics was 18.8 µg/dL compared to 11.8 µg/dL in children living in households not using these ceramics. A major factor in the high BLLs was use of leaded glazed pottery to store fruit juice consumed by the children. Children drinking juice from this type of pottery had a mean BLL of 22.2 µg/dL, whereas children who did not had a BLL of 12.4 µg/dL.

Environmental lead in the air from leaded gas was also a factor.

Hernández-Serrato et al. (2003) studied a community of ceramic folk art workers in Oaxaca, Mexico to assess the risk of lead poisoning as a result of the manufacturing of
the folk art. The researchers reported artisans had BLLs of 43.8 µg/dL, above the standard set by the World Health Organization (WHO) of 40.0 µg/dL, requiring workers to be removed from the source of lead exposure, because of imminent renal damage acceleration. Data from this study revealed BLLs were significantly higher from the use of lead-glazed ceramics for food storage or cooking (45.6 µg/dL in men versus 36.2 µg/dL in women). Even those without occupational exposure risk experienced very high BLLs: farmers (43.1 µg/dL), students (38.6 µg/dL) and housewives (37.2 µg/dL).

Molina Ballesteros, Zuniga, Cárdena Ortega, Solis Cámara (R) and Solis Cámara (V) (1982) found 43% of the children of ceramic folk art workers in the state of Oaxaca, Mexico had BLLs > 40 µg/dL. Approximately five million potters, many whom are members of indigenous groups, produce clay pottery with decoration traditional to their region and culture found in 20 Mexican states. These potters work from home, including all family members between 7 to 70 years of age in the pottery making process, while employing no personal protection at all (Mexican Secretariat, 2005).

Traditions on using glazed pottery are deeply entrenched in the Mexican population and immigrants arriving in the U.S. One viable alternative to lower the lead exposure to this population may be to change the process and materials utilized by the artisans. FONART (the Mexican National Foundation for the Development of Folk Art) is collaborating with Aid to Artisans (ATA) to implement a program to educate artisans about a safe, lead-free method for making the pottery and clay vessels (Aid to Artisans, 2002, 2010). The Lead-Free Alliance Program provides workshops to potters, introducing lead-free glazes, lead-free kilns, new cleaning and recycling methods to remove lead contamination from tools and facilities. The program raises awareness of the
occupational health risks associated with the daily use of lead glazes among the artisans themselves and links artisans to new markets for their goods. In spite of this program, some products being exported to the U.S. labeled as lead free have been found to contain toxic levels of lead. Testing of these items is the only way to know if the items contain lead or are lead free.

**Clay Eaters—Pica Behavior in Adults**

Although Mexican traditions are entrenched in the use of glazed pottery for cooking and serving food and drinks, some researchers report about Mexican women and Mexican immigrants who enjoy eating unusual substances, such as clay soil or pieces of glazed pottery (Bruhn & Pangborn, 1971; Shannon, 2003; Erdem et al., 2004; Hamilton, Rothenberg, Khan, Manalo & Norris, 2001; Lopez, Ortega Soler & Pita Martin e Portela, 2004). This craving for substances not commonly regarded as food or accepted as normal food by the culture is called pica behavior (Lacey, 1990; Horner, Lackey, Kolasa & Warren, 1991; Hamilton et al., 2001; Viguria Padilla & Miján de la Torre, 2006). Pica has been observed in men, women and children of all ages. The most commonly reported pica includes cravings for substances, such as clay and dirt (geophagia), starch (amylophagia) or ice (pagophagia), but may also encompass other substances not frequently studied. Pica has most often been reported in African Americans in the rural south with a family history of pica, and pregnant women of all races and from a lower socioeconomic level (Smulian & Motiwala, 1995; Bruhn & Pangborn, 1971; Horner et al., 1991; Lacey, 1990). Geophagia (pica of clay soil and dirt) is recognized a major source of lead for children and for adults.
Several studies on pica behavior reveal the impact of eating unusual substances on the body. Rothenberg, Manalo, Jiang et al. (1999) showed a history of pica and/or low dietary calcium intake were significantly associated with higher BLLs in pregnant Mexican immigrants living in South Central Los Angeles. Shannon (2003) reported on seven severely lead-poisoned pregnant women and eight additional cases found through a Medline search. Of these eight cases, 83% of the women identified their source of lead poisoning from ingestion of soil, clay, or pottery. Simpson, Mull, Longley and East (2000) reported on the pica behavior of 225 Mexican-born women (75 of which were interviewed in Ensenada, Mexico and the other 150 in Southern California). The prevalence of pica in the group from Ensenada was 44% (33/75) and of the U.S. sample was 31% (46/150). Reasons given for the pica behavior included having strong cravings for the dirt or clay soil, saying they enjoyed the taste, having someone recommended the substance or doing it for religious reasons.

Geophagia (the craving for substances, such as clay and dirt) has been attributed to physiological and psychological reasons and cultural, religious and medical beliefs (Hooda, Henry, Seyoum, Armstrong, & Fowler 2002; Hooda, Henry, Seyoum, Armstrong & Fowler, 2004). Some communities believe geophagia can replenish necessary calcium, iron and other minerals needed during pregnancy. Yet when Lopez, Pita Martin de Portela, and Ortega Soler (2007a) investigated the characteristics of nutrient intake in 71 Mexican pregnant women diagnosed with various forms of pica, their results showed these women had lower intakes of carbohydrates, animal proteins, hemic iron, and zinc. In another study of 324 women selected postpartum, Lopez, Langini, and Pita Martin de Portela (2007b) found 71 of them with pica behavior had a
greater prevalence of iron deficiency than the non-pica group. Rainville's study (1998) of 281 pregnant women revealed subjects with pica behavior had lower hemoglobin levels at delivery than women who did not report pica. These studies show the need for diagnosing this eating disorder early in the woman's pregnancy in order to address the nutritional deficiencies and, depending on the pica behavior, possible lead exposure to the mother and fetus.

**Mexican Candy**

While children and adults have been exposed to lead through pica behavior, lead has also been introduced to unsuspecting consumers via candy imported from Mexico (Calif. Dept of Health Services, 1993, 1994a, 1994b, 1998, 2001, 2004; CDC, 2002a). Since 1993, the California Department of Health Services has issued six health alerts and documented more than 1,500 tests of Mexican candy. About 25% of the test results have shown high lead contents from the leaded ink used on the candy's paper wrapper, from the leaded glaze that covers small clay pots holding acidic tamarind fruit candy or from unwashed chilies (carrying lead from soil or from other sources into the candy).

The CDC (2002a) reported on two lead poisoning cases in California from the use of Mexican candies from 1999 through 2000. The FDA focused its earliest tests on lead-glazed clay pots and candy wrappers printed with lead-based ink. The tamarind packaged in lead-glazed pots were found to elevate BLLs in some children to 40 - 50 µg/dL. On numerous occasions, the FDA alerted the public to stay away from Mexican-type candies, primarily those containing chili and tamarind (FDA, 1995a, 1995b, 2005, 2007, 2008, 2009). From August through October 1994, lollipops from Mexico (and their wrappers) with high lead levels were not allowed by inspectors to enter the country. In 1995, the
FDA alerted candy manufacturers about considering action against candy products containing 0.5 ppm or less lead, when the amount of lead per serving was 10 µg or more. That same year, fresh and frozen tamarind fruit was banned from import to the U.S. from all countries due to filth (FDA, 1995a). A few candy manufacturers from Mexico were excluded from the ban.

In 2005 (with a 2007 revision), the FDA issued alerts and recalls on candy containing lead, such as tamarind candy/lollipops, Vero Dulces flavored with chili powder, Pancho's Hot Orange Jellies, Chaca candy, tamarind candy in ceramic jars, chocolate flavored candy, Choco Buttons and Andinetas, Dulces Tamalito and dried fruits. A Chaca Chaca chili-coated candy tested by the FDA contained as much as 0.3-0.4 µg lead per gram of product, with one piece of candy alone weighing 35 grams (Medlin, 2004).

The FDA developed a support document to evaluate a proposed change in action level for lead in candy from 0.5 ppm to 0.1 ppm. The document contained testing data of several types of imported Mexican products (2006a) and their lead levels. Analyses conducted October 2000 to February 2004 found 60.6% of the Mexican-Style candy samples (80/132) had levels from 0.150 ppm to >0.250 ppm. From that group, 13.6% (18/132) had levels > 0.250 ppm. Chilies were ingredients in 7.5% (10/132) of the total candy batch with the highest level of lead. Unwashed chilies had a higher lead content than washed ones. Analyses of salt-based powdered snack products identified 3 products containing over 0.5 ppm lead, primarily from mined salt. The 22 samples of tamarind pulp tested during this period showed an average lead concentration of 0.014 ppm, below the standard set by the FDA, showing the wrapper and lead-based ceramic pot as factors for the lead problem and not the fruit itself.
The FDA reduced the action level to 0.1 ppm, at which time the agency began requiring Mexican-style candies to meet the provisional total tolerable intake level (PTTIL) for lead. The PTTIL sets the total daily lead intake from all sources to be less than 6.0 µg per day for children under six years of age (2006a). The FDA also updated its Guidance for Industry: Lead in Candy Likely to be Consumed Frequently by Small Children: Recommended Maximum Level and Enforcement Policy (2006b).

U.S. government officials have a difficult time tracking imported candy from Mexico. Medlin (2004) reports many of the candy shipments are sent via the grey markets, where pickup trucks transport small, informal shipments to small, family owned stores in California, Texas, New Mexico and Arizona. Candies are purchased by unsuspecting customers, eager to savor products from back home. Although childhood lead poisoning of U.S. children as a result of lead in imported candy cannot be quantified, San Diego-based non-profit Environmental Health Coalition has been able to link lead-contaminated candy to 15% of the child lead poisoning cases in California (Medlin, 2004).

Much of the data on the effects of lead in Mexican-style candies have been reported by the FDA, CDC, California Department of Health Services and other states. Researchers Lynch, Boatright, and Moss (2000) analyzed the Oklahoma State Department of Health Lead Poisoning Database to determine if Hispanic children had a higher risk of EBLLs than other children. The analysis of Spanish surnames showed 3.7% of Hispanic children under 7 years old had EBLLs compared to 2.9% of non-Hispanic children statewide and 2.6% of Non-Hispanic children in Oklahoma City. The highest number of Hispanic children with EBLLs came from six zip codes of the south central area of Oklahoma City, where 6.1% of Hispanic children tested from 1994-1999
had EBLLs. The analysis revealed 17% of children with EBLLs in the state and 42% of children in Oklahoma City were Hispanic, even though only 3% of the state population in 1990 was Hispanic.

Lynch, Boatright, and Moss (2000) further studied the lead levels of two types of Mexican tamarind suckers and modeled the predicted effects of candy consumption on the BLLs of the Hispanic population in this area. Results of laboratory tests showed 25% (5/20) of the samples of sucker #1 and 80% (16/20) of the samples of sucker #2 exceeded the 0.5 µg/kg FDA level of concern (prior to 2006) for lead in tamarind candy. The wrappers also contained lead concentrations over the 7 µg/kg FDA guideline for food product surfaces (2000; 2006b). The model for consuming a sucker once a day predicted a five-fold increase in the prevalence of BLLs $\geq 10$ µg/dL for sucker #1 and an 11-fold increase for sucker #2. When sucker #1 and sucker #2 were consumed once a week, the model predicted prevalence levels would be raised by 6% and 88%, respectively.

Government, public health and advocacy groups joined forces in California to warn consumers about lead in candy. A series of articles entitled Toxic Treats, which appeared in the Orange County Register (California) in 2004, prompted an investigation of leaded candy and a subsequent filing of a lawsuit known as Proposition 65 against Mexican candy companies. The California State Attorney General, the Alameda County District Attorney, the Los Angeles City Attorney, the Environmental Health Coalition and Center for Environmental Health joined forces against 34 Mexican style candy companies whose products had high lead levels in their candy or wrappers, according to independent lab results (Personal conversation with Assistant Los Angeles City Attorney Patty Bilgin, 2008). In 2006, a settlement was signed by the two largest culprits, a Hershey and a Mars
subsidiary and several Vero companies. The other 22 defendants signed in 2007. The
settlement required an action level in candy at 100 parts per billion (0.1 ppm) based on an
average of the samples of a particular product family from a single lot (compared to the
original FDA requirement of .5 ppm). Other restrictions in quality control and
packaging, types of salt and chilies used, and audits of manufacturing facilities were
implemented. Representatives from the California Department of Public Health, Mars
and Hershey have reported dramatically lower lead levels in Mexican style candies since
the Proposition 65 lawsuit settlement.

In 2005, before the settlement with the Mexican candy makers was signed,
Gerstenberger, Savage, Sellers, Zupnik and Gorospe (2007) sampled 50 imported Latin
American candies sold in markets in Southern Nevada catering to Hispanics from Mexico
and other Spanish-speaking countries. Of this number, 20 (40%) tested positive for lead
in the candies’ wrappers and straws. In response to the results of this sampling, a cease-
and-desist order to commercial establishments that sold the tainted candies was issued by
the Southern Nevada Health District (SNHD) on February 13, 2006. Concurrently, the
SNHD conducted an analysis on a limited collection of lead screening laboratories
results, which identified 13 children with EBLLs who were likely associated with
Mexican candy consumption. The link to Mexican candy consumption was made during
home lead-risk investigations, where lead-contaminated candies were found. Subsequent
analyses of laboratory lead screening results during April 2006 through December 2007,
revealed the three most frequently found potential lead hazards during home
investigations were tile, imported candies and parent occupation (SNHD, 2008).
In a subsequent study conducted from September 2009 through January 2010, Mexican style candy was bought at ethnic stores and a swap meet in the Las Vegas Metropolitan area. Of the 597 Mexican candies that had been tested for lead, 11 items were found to be above the FDA action level of 0.1 ppm. The items ranged from 6.4 ppm to 15.4 ppm. Tamarind candy in small clay pots were among the primary culprits with lead (Burns, 2010)

**Jewelry/Charms/Vending Machine Items**

Although Mexican candy can be a common source of lead exposure, lead can be introduced in children's bodies when they place in their mouths unsuspected objects, such as jewelry (gold or costume) and charms or necklaces bought in vending machines. In 2003, a 4-year-old child swallowed a medallion from a necklace made of lead that was bought from a vending machine. The medallion's contents was found to be 38.8% lead (388,000 mg/kg), 3.6% antimony, and 0.5% tin in a test by the state environmental quality lab. Similar medallions purchased from toy vending machines in other areas of Oregon were found to have similar high proportions of lead (44% and 37%). As a result of the investigation, the Consumer Product Safety Commission (CPSC) issued on July 8, 2004, a recall of 1.4 million metal toy necklaces made in India and distributed in the U.S. (CDC, 2004, 2010d). During this year, CPSC announced recalls of more than 150 million pieces of toy jewelry sold in vending machines and through other outlets.

In 2005, the CPSC established a new enforcement policy to reduce the potential for health risks from lead in children's metal jewelry. The new policy provided guidance to manufacturers, importers and retailers on minimizing the risk for children. This guidance explained testing procedures to be followed by CPSC staff and identified action levels for
further attention. For example, CPSC staff will test each component in a jewelry piece 
(i.e., necklace consisting of a chain, a clasp, a pendant and one or more types of beads). If 
the lead content of each component is less than or equal to 600 parts per million (ppm), 
the staff will not pursue a recall or other corrective action. If the lead content of any 
component exceeds 600 ppm, Commission staff will then conduct further testing using 
the acid extraction method. If the acid extraction test yields an amount of accessible lead 
less than or equal to 175 µg, no corrective action will be sought. On a case by case basis, 
CPSC staff will decide on corrective action for items whose test yields higher than 175 
µg.

Even after the guidelines were announced by the CPSC, in 2006 another child died 
from acute lead poisoning after ingestion of a heart-shaped metallic charm containing 
lead. The charm (CDC, 2006a) attached to a metal bracelet provided as a gift with 
purchase of Reebok shoes. A voluntary recall of 300,000 heart-shaped charm bracelets 
was reported on March 23, 2006, by CPSC and Reebok (CDC, 2010d).

Health Beliefs, Folk Beliefs and Folk Healers

The health of Hispanics can be impacted not only by ingestion of candies and 
jewelry containing lead but by cultural practices that include the use of folk medicine and 
folk healers to address disease. These cultural practices have been influenced by the 
teachings, traditions and health beliefs passed down Hispanics from generation to 
generation. The discussion below documents Hispanic health beliefs and practices as 
identified by seminal anthropological studies conducted more than 30 to 50 years ago 
about urban dwellers and migrant workers, combined with more recent clinical research 
about the same group.
While the Hispanic population constitutes a multicultural community whose members come from Mexico, Cuba, Puerto Rico, Spain and Central American and other Spanish-speaking Latin American nations, most of the available research on health beliefs and cultural practices has been conducted on Mexican immigrants or Mexican Americans. People of Mexican descent represent almost 65% of the U.S. Hispanic population, 77.8% of the Clark County, Nevada Hispanic population (Pew Hispanic Center, 2009; U.S. Census, 2009d, 2009e) and a large percentage of the Hispanic population in California, Texas, Colorado and New Mexico. Subgroups from countries other than Mexico represent a much smaller percentage of the Hispanic population, hence the limited number of studies about this subject.

Hispanics of Mexican descent who immigrate to the U.S. have a tendency to isolate themselves from the Anglo community by living in Hispanic barrios, separated by language differences and social class (Sandler & Chan, 1978; Gordon, 1994; Reinert, 1986; Rodriguez, 1983; Chestney, Thomson, Guevara, Vela & Schottstaedt, 1980). Religious affiliation, low income, limited vocational opportunity and similar cultural values and beliefs further isolate these individuals of Mexican descent from the larger culture. Lack of access to health care and transportation options, inability to acquire health insurance, unfamiliarity with available health care services and failure to speak English (Reinert, 1986; Sandler & Chan, 1978; Treviño & Moss, 1984) create a chasm between Mexican immigrants and Mexican Americans and the main population.

Researchers believe the socio-cultural isolation of this population helps preserve many of the folk beliefs inherited from their Spanish ancestors (Martinez & Martin, 1966; Baca, 1969; Clark, 1970; Kay, 1977; De la Torre & Estrada, 2001) and prolongs the use of
cultural practices to diagnose and treat illnesses within the family (Martaus, 1986; Gordon, 1994). Immigrants of Mexican descent are reported by Reiner (1986) and Rodriguez (1983) to preserve their cultural folk beliefs, because they often live close to Mexico, they are able to cross the border easily and have contact with a constant flow of new immigrants who are Spanish-speaking only. The use of language and old country traditions further impede the ability of Mexican immigrants from becoming assimilated.

Researchers (Abril, 1977; Wells, Golding, Hough, Burnam & Karno, 1989; Sandler & Chan, 1978; Clark, 1970) explain the degree to which folk beliefs and practices are accepted varies with Mexican Americans from generation to generation and is dependent on education and extent of acculturation. The more educated the Mexican American and the longer the time in the U.S., the less use of folk medicine. Germain (1992) reports the insulated Mexican American population manages between 70 to 90% of self-recognized episodes of illness outside the formal health care system. In cases other than acute emergencies, it is likely individuals who are experiencing illnesses have resorted to popular folk systems before they seek professional medical help.

Hispanics generally perceive illnesses as natural or unnatural in nature (Clark, 1970; Foster, 1953; Holland, 1963). Foster (1953) first reported about Spanish-American folk medicine after reviewing ancient documents from Spain, Mexico, Central American and Spanish-speaking countries in Latin America. These documents described the cause of disease as based on natural phenomena (diseases for which a known external factor produces the illness), the supernatural (diseases from God or the almighty), magical origins (diseases from spells from witches, etc.) and emotional concepts (diseases from strong emotions, such as fear, shame, anger, envy, disillusion, etc.). Foster documented a
large number of recognized and named illnesses, which result from a series of emotional experiences. Most common among these illnesses are empacho (stomach ailment), mollera caida (fallen fontanel), mal de ojo (evil eye), and susto (fright). These diseases are recognized by many of the subcultures within the Hispanic population, especially Mexican immigrants and Mexican Americans.

Foster's seminal study credited the varied beliefs and practices in folk medicine of today to the influence of invaders who conquered Spain over several centuries. He attributed the idea of fire and water to the pre-Christian beliefs of the Celts, the use of votive offerings to the Greeks and Romans, the use of prayer and invocations to the Christians and the belief in the evil eye to the Arab conquerors. New World Native American medicine further shaped Spanish-American folk beliefs by adding susto or "loosing" one's soul as a result of fright, possession of evil spirits and by being injured through witchcraft. Illness often evolved as a byproduct of these happenings.

The Greek humoral doctrine was adopted by Spanish-American folk medicine after it was adapted by the Arab world, brought to Spain as scientific medicine during the Moslem domination and transmitted to America at the time of the Spanish conquest (Foster, 1953; Currier, 1966; Risser & Mazur, 1995). Much of the beliefs about disease and health are explained through the use of the humoral doctrine—how the basic functions of the body are regulated by four bodily fluids, or humors. These humors have been characterized by a combination of heat or cold with wetness or dryness—identified as blood (hot and wet), yellow bile (hot and dry), phlegm (cold and wet), black bile (cold and dry). Good health was equated to balanced humors, while an imbalance resulted in illness. In modern folk medicine, the wetness and dryness have disappeared, while the
hot-cold syndrome has persisted. This doctrine recommends avoidance of exposure to extreme temperatures as a way to health.

For Hispanics, the concept of illness or disease is intertwined with the omnipotent God who controls their personal lives, subject to his judgment and justice (Foster; 1953; Samora, 1961; Baca, 1969; Kay, 1977; Chong, 2002). Hispanics often perceive events in their lives as supernatural punishments, castigos, as a result of not behaving properly or not following God’s laws. Illness can be interpreted as a punishment or as a suffering or hardship imposed by God. If it is a suffering, it may mean one may have to withstand illness, being poor, separation from loved ones, delinquent children, being an alcoholic, having a mean husband, overall bad luck, etc. Even when ill health comes from spells cast by brujas (witches), God remains in control. Since God creates everything in this world, he also allows illness to occur.

In the Mexican American family, the woman of the household diagnoses illnesses and decides when someone outside the family must be called to treat the sick person (Reinert, 1986; Gordon, 1994; Martaus, 1986; Eggenberger et al., 2006). The male head of household has ultimate authority over the treatment plan to be implemented. It is the woman of the house who will prescribe and administer folk medicine for minor ailments (i.e., headaches, mild colds, and stomachaches). She may seek the advice of an older woman if she needs assistance. Home treatment will be tried first for minor, natural illnesses and decisions about all treatment will be made within the family network (Clark, 1977; Martaus, 1986; Lopez, 2005).

In a study of 20 Mexican and Mexican-American migrant farm workers, Martaus (1986) reported the subjects explained illness through three belief models: the hot/cold
imbalance, germ theory and emotional origin. The hot/cold belief system was reported most often (i.e., body became overheated and night air caused a chill and wheezing). Only farm workers under 30 years of age used the germ theory to explain their illness.

Germ theory is a belief that illness is caused by bacteria, viruses or other microscopic organisms infecting the host. There are recognizable symptoms and germs are transmitted. Women subjects, on the other hand, described their illness experiences as emotional in origin. Symptoms of illnesses were experienced in the heart and stomach (i.e., stomach pain and cramps). This study confirmed research showing the woman as the decision maker about health, with the male of the house as the final ultimate authority (Reinert, 1986; Gordon, 1994; Martaus, 1986; Eggenberger et al., 2006).

An earlier study of health beliefs conducted by Abril (1977) showed Mexican Americans migrant workers perceive illness as a state of discomfort. They consider themselves healthy if they are able to maintain a high level of physical activity and if they are free from persistent pain and discomfort. If they show no outward symptom of disease (i.e., cancer, tuberculosis, or heart disease), they believe to be well and healthy. Because of this belief, it is difficult to counsel Hispanics on the area of prevention.

When someone is sick, Mexican American family members will rally around the sick person. They may use prayer as a way to appease God during illnesses and in combination with visiting holy places, offering candles and making promises (Samora, 1961; Clark, 1970; Graham, 1979). When the prescribed folk medicine treatment given at home does not work, the sick person will be referred to other lay healers, such as a sobador (masseuse/ bonesetter), a yerbero/herbolario (herbalist), or a partera (midwife), depending on the health problem.
Research about the use of a sobador (masseuse/bonesetter) is limited. Kay (1977) reports on an ethnomedicine (health beliefs and practices) study of a Mexican American community in the Southwest. In this Southwest community, the position of sobadora was usually occupied by a woman who had learned the skills from her mother or grandmother. She gave therapies (i.e., rubbed a pain or fixed a joint) instead of medicines. She often treated cases of empacho (stomach illness) or mollera caida (fallen fontanel). A study by Anderson (1987) however, reported on a sobador from Ciudad Juarez, Mexico (across the border from El Paso, Texas) who limited his practice to the care of musculoskeletal pain or stiffness and cuts and bruises exclusively. He did not deal with empacho or fallen fontanel. During nine months, Anderson, a chiropractor in the U.S., pre-examined the patients visiting the sobador, in order to confirm diagnostic conclusions of the sobador. The treatment provided by the sobador was found to meet medical standards of practice for safety, efficacy and cost containment. Huber and Anderson (1996) studied the sobadores of an indigenous Mexican village in the Sierra Norte de Puebla, Mexico. In this village, the sobadores were males, while the much higher status role of the curandera was held by women. Within this community's sobador hierarchy, the sobador who prayed over bones but did not set them was considered to be far superior than a traditional bonesetter. In Southern Nevada, conversations between the author of this document and Mexican American housewives with whom she interfaces highlighted the use of the female sobador for minor ailments (i.e., empacho, fallen fontanel, etc.). Treatment by the sobadora included the use of oil to massage designated areas according to illness (i.e., stomach, back, or arms, etc.) or recommendation to drink herbal teas.
If the illness requires a healer other than a sobador, family members may seek treatment from a highly trained, skilled practitioner called curandero (male) or curandera (female). Curanderos practice in the community they serve and are completely integrated with their clients. The curanderos share their patients' class, background, language and religion as a system of identifying disease (Alegria, Guerra, Martinez & Meyer, 1977). A study (Hamburger, 1978) based on interviews with 14 of 17 curanderos in Southern California revealed a typical curandero from this area was in his mid-50s, married and had 5.5 years of schooling and training in his craft. Curanderos are often recommended by close or extended family members and sometimes by individuals outside the nuclear family. A family may consist of nuclear members and include godparents (compadres), existing from baptisms, confirmations, marriages and other rituals from the Roman Catholic Church (Clark, 1970).

It is believed curanderos acquire their healing gift by divine will. It is also recognized that many curanderos learn their craft from close relatives or through apprenticeship to a renown curandero (Ness & Wintrob, 1981; Holland, 1963; Mull & Mull, 1983; Alegria et al., 1977). Curanderos include good nutrition and a positive relationship with family and God as components to good health. Physical symptoms, such as headaches, gastrointestinal distress, back pain and fever are treated by curanderos with a large selection of herbal remedies, enemas and massage. Prayer, calling upon the spirits, and dramatic healing rituals are part of the treatment for psychological complaints of anxiety, irritability, fatigue and depression and supernatural illnesses (i.e., mal de ojo (evil eye), susto (fright) or a castigo (punishment) by God or the saints or witch). There have been speculations that Mexican Americans are utilizing curanderos for their mental
health complaints, hence the underrepresented utilization figures of public mental health facilities (Barrera, 1978; Acosta, 1979; Keefe & Casas, 1980). These speculations have not been substantiated by research (Barrera, 1978; Acosta, 1979; Keefe & Casas, 1980), although studies have shown curanderos treat certain psychological complaints more often in rural settings than in urban areas (Padilla et al., 2001).

Each treatment provided by a curandero is unique to the patient, expected to bring results within a relatively short time and includes the active participation of the patient in the curative procedures (Alegria et al., 1977; Mull & Mull, 1983; Padilla et al., 2001). Nearly all of the procedures used by curanderos are nonintrusive and usually known to the patients. Patient and healer understand religious faith is an essential component of the curing process. In many cases, curanderos also respond to more than folk illnesses. Some patients who have been diagnosed with hypertension, diabetes or renal problems refuse to return to their Western medical practitioners. Reasons for the patient's unwillingness to bond with the Western practitioner include their inability to speak English fluently or perception the physician is unfriendly or cold (Arguijo-Martinez, 1978; Baca, 1969; Amerson, 2008). The curandero will refer patients to a Western practitioner in cases of major medical emergencies like broken bones, gunshot or knife wounds, myocardial infarctions, epilepsy, high fevers and major psychiatric problems. As a result of these referrals, researchers report the concurrent use of services of folk and medical systems by Hispanics of Mexican descent (Risser & Mazur, 1995; Alegria et al., 1977; Ness & Wintro, 1981; Sandler & Chan, 1978; Martinez & Martin, 1966; Montiel-Tafur, Crowe & Torres 2009; Amerson, 2008; Mull & Mull, 1983).
Although an ample number of studies about curanderos was available, Higginbotham, Treviño and Ray (1990) report usage of this folk healer in the U.S. is low. These researchers reviewed data from the 1982-1984 Hispanic Health and Nutrition Examination Survey (HHANES) where 3,623 Mexican Americans were interviewed. Of this number, only 148 persons or 4.2% of the sample (persons between the ages of 18-74 years) reported using a curandero, yerbero or other folk medicine practitioner within the 12 months prior to the survey. From this number, about 58.1% were males, 64.2% were between the ages of 18 and 44 years, 46.6 had less than 8 years of education and 48.4% had lived less than 2 years in the U.S. Regression analyses revealed a relationship between Mexican cultural orientation (by preferring to be interviewed in Spanish) and dissatisfaction with medical care received. Ability to pay and availability of care (reported of a regular source of care) were not related.

One recent study by Lopez (2005) suggested curanderos exist in geographical locations of the U.S. with large Hispanic populations of Mexican descent. Through a self administered questionnaire, more than 70% from a sample of 70 Spanish-surnamed Hispanic college female students enrolled in a social work program at a Southern California university revealed they were familiar with the term curandera. A majority of this sample knew someone who had used a curandera, while more than 25% of the sample had personal experience with a curandera. Padilla et al. (2001) reported on the results of a survey of 405 subjects attending outpatient primary and urgent care clinics at Denver Health Medical Center. Of the 405 subjects, 118 (29.1%) had been to a curandero at some time in their lives. Of all the subjects, 91.3% knew what a curandero
was. Lower levels of income and education and whether a subject was bilingual were associated with subjects who had been to a curandero.

**Folk Diseases and Remedies**

As identified by cited studies, traditions about folk beliefs are taught within informal networks and outside formal institutions, such as medical schools, professional associations and libraries. Folk remedies, recipes and treatment modes are passed down from mother to daughter, from older woman to other women within the nuclear and extended family network (Samora, 1961; Graham, 1979; Clark, 1970; Baca, 1969). The most common folk diseases treated by folk remedies are empacho (stomach ailment), mollera caida (fallen fontanel), mal de ojo (evil eye), and susto (fright) (Ackerman & Rodman, 1984; Baer & Ackerman, 1988; Baer et al., 1989; Baer et al., 1998; Bose, Vashistha & O'Loughlin, 1983; McKinney, 1999; Trotter, Ackerman, Rodman, Martinez and Sorvillo, 1983). Of these folk diseases, the treatment for empacho poses a higher risk for small children, because of folk medicines that contain high levels of lead. More information about empacho and its treatment follows.

Folk beliefs defined empacho as caused by a ball or collection of undigested food that sticks to the wall of the digestive tract. This ball/undigested food causes stomachache, distention, diarrhea and vomiting (Mull & Mull, 1983; Baca, 1969; Martinez & Martin, 1966; Foster, 1953). Besides the stomach discomfort, children experience fever, crying and restlessness. Swallowed gum, poorly mixed powdered milk or formula, grape skins and un-ripened bananas are often implicated. Empacho may occur in any age group or gender. The treatments most often reported for dislodging the food from the wall of the stomach were rubbing the stomach or rubbing the back, or more precisely, pinching the
back (Mull & Mull, 1983; Martinez & Martin, 1966; Holland, 1963). Azarcón (lead tetraoxide) and greta (also known as liga and lead oxide) have been identified as home remedies being used for empacho. These home remedies are typically recommended by señoras, family friends or by folk healers (curanderos or sobadores) and sold at herbolarías/botánicas (herb shops) in Mexico and the U.S. Azarcón and greta are not regulated by the FDA and have been found to contain lead as high as 770,700 parts per million (ppm) (CDC, 2002). The lead content for these folk remedies has also been reported as 86 to 95% and 86 to 90% lead by weight, respectively (Bose et al., 1983; Baer & Ackerman, 1988; Trotter et al., 1983).

Trotter (1981) collected data on folk (home) remedies used by Mexican American communities in South Texas. A sample of 1235 case examples of home remedies was analyzed. Survey respondents were asked the types of home remedies used to determine the morbidity of this population. Listed were folk illnesses, such as susto, empacho, mal de ojo, and mollera caída and other groups of ailments that provide insight into the self treatment of health care problems by the Mexican Americans. Respondents used folk (home) remedies for digestive system problems, upper respiratory ailments, infectious and parasitic diseases, injuries and environmentally produced ailments, other acute conditions, mental problems and chronic ailments. Digestive system problems accounted for 20.7% of the total cases in the sample taken. In another study conducted by Trotter et al. (1983), empacho was being treated in anywhere between 25 to 96% of the households in 31 different locations in Texas, New Mexico and Arizona, and instances reported in California, and Colorado. The study showed approximately 20% of the households treating empacho used greta or Azarcón.
Lead poisoning from Mexican folk remedies have been documented in California, Colorado, and Nevada since the 1980s. In June 1981, a 4-month old Mexican American infant was treated successfully after being admitted to a medical center in Los Angeles County with vomiting and diarrhea. These symptoms were determined to be caused by Azarcón (lead tetroxide) (CDC, 1981; Bose et al., 1983). Two subsequent examinations conducted ten days apart reported BLLs of 45 µg/dL and 27 µg/dL. In May 1982, a 15-month-old California child and his 3-year-old sibling were given in Mexico multiple doses of Azarcón for diarrhea, which had not responded to ampicillin treatment. The children were taken to a San Diego Hospital in June where the BLL of the younger child was 124 µg/dL. The 3-year-old died of seizures. In 1982, another 8-year old Mexican American boy was admitted to a San Diego medical center and successfully treated for BLLs of 93 µg/dL from Azarcón, determined to be 100% lead tetroxide (Manoguerra, Kearney, & Shamaik, 1983). These cases prompted the public health department to investigate the use of Azarcón and greta in the Los Angeles area. A survey was conducted in 545 systematically selected households surrounding the Los Angeles County hospital. Respondents in almost 25% of the Mexican-Hispanic households were familiar with one or both of the substances. About 7.2 to 12.1% of respondents admitted to having used the substances "years ago" to within the past month of the survey. Investigators noted a reluctance of respondents to admit to using Azarcón or greta. It is estimated usage of these substances might have been greater than shown by survey results (CDC, 1983).

In Colorado, a 2 and 1/2 year old girl (Bose et al., 1983) was found to have a BLL of 59 µg/dL but no lead paint was found in the child's home. Two months later, when the
BLL increased to 137 µg/dL, the mother confessed to investigators the grandmother from Mexico had sent a bottle of Azarcón to be used for empacho. In 1982, a Colorado survey of migrant workers conducted from June through September of that year showed 7.0% of 100 migrant children under 12 years of age had been treated with Azarcón or greta at some time for gastrointestinal illness (CDC, 1983).

Surveillance data from December 1, 1991 through December 31, 1992, was received by the California Department of Health Services on 40 cases with BLLs ≥20µg/dL (CDC, 1993b). Of the 40 children, 24 were asymptomatic. Of the asymptomatic children, 3 had BLLs >50 µg/dL and 2 had BLLs >80 µg/dL. For 36 of the 40 cases, the use of Azarcón and greta, was reported. The other 4 children with EBLLs ingested remedies from Asia, India and Tibet that contained lead. In 7 of the 18 cases that received environmental investigations (i.e., their homes were checked for lead), investigators identified other sources (i.e., leaded paint, bean pots and soil) at levels that contributed to the lead exposures. About half of the children with EBLLs were identified through routine screening of children, which was initiated in California in late November 1991.

Baer et al. (1998) studied a Mexican community on the use of lead (greta or Azarcón) to treat empacho. Of 141 individuals surveyed in 1994, 100 (71%) reported having treated empacho. Further interview sessions with this latter group showed the working class and poor women were most likely (79% and 84%, respectively) to have treated empacho. Lead was used as a remedy by 16% of the women in the sample. The attributable risk to the population was 11%. The study was compared to results from a 1987 study conducted by the same researchers. In 1987, lead was used by 35% of the sample population to treat empacho as compared to 18% of the 1994 research. The risk
ratio indicated the risk of lead use in 1994 was half of that in 1987. The study reported a significantly fewer mothers in 1994 were familiar with the use of lead for *empacho*.

From 1999 - 2000 in Stanislaus County and in 2000 in Fresno County (both in the Central Valley of California) and Orange County (CDC, 2002a), additional cases were reported on the use of *Azarcón* and *greta*. In Nevada, Cabb et al. (2008) reported a case of a 3-year-old child who was treated with *greta* for persistent abdominal pains and diagnosed with an EBBL of 19 µg/dL. The child had been taken to a Hispanic folk healer (*curandera*) and treated with *greta* for *empacho* (abdominal problems). SNHD reported six cases from August 2007 through March 2009 regarding EBLLs associated with folk remedies or folk healers: two cases involved a *curanderol/sobador*, two cases were associated with folk healers and home remedies (including unknown powder, such as *Azarcón* and *greta*) and two other cases reported using home remedy (i.e., such as herbal tea (SNHD, 2010b). Prior to August 2007, the Department of Environmental and Occupational Health of the University of Nevada Las Vegas' School of Community Health was responsible for investigating EBLLs that were voluntarily reported to SNHD. Findings from environmental investigations of EBLLs identified 14 cases associated with folk remedies and/or folk healers (Gerstenberger, 2007). Of this total, three saw a *curandera/sobadora*, two used a powder for stomachache identified as *greta*, and five used home remedies, such as herbal teas (i.e., mint or chamomile) and over-the-counter medications bought at local Hispanic supermarkets. Cabb (2007) in her Master thesis, interviewed 23 Hispanics and studied four social-cultural factors related to Hispanic children's BLLs. These socio-cultural factors included consumption of Mexican-imported candy, use of clay ceramic bean pots and gold jewelry from Mexico, and use of
folk remedies. Two of the twenty-three families had *greta* in their homes with lead concentrations of 330,000 ppm and 910,000 ppm. Approximately 87% (20 out of 23) of the families reported participating in at least one of the four socio-cultural practices which have been determined to contain lead. Even with the data provided by these local reports, the full extent of the use of folk remedies in Southern Nevada is still not known.

**Socioeconomic Factors**

A large body of research links poverty with lower levels of child well-being (U.S. GAO, 2007; Brooks-Gunn & Duncan, 1997; Crooks, 1995; Anderson-Moore, Redd, Burkhauser, Mbwana & Collins, 2009; CDC, 2009b; Mather & Adams, 2006). When compared with children from more affluent families, poor children are more likely to have low academic achievement, to drop out of school and to have health, behavioral and emotional problems. Children who experience deep poverty, are poor during early childhood and trapped in poverty for a long time seem to experience more strongly the indicators listed above (Anderson-Moore et al., 2009; Korenman, Miller & Sjaaastad, 1995). Poor children are also disproportionately exposed to risk factors, including environmental toxins (such as lead), substandard housing, disadvantaged neighborhoods (McLoyd, 1998; Needleman, 1990; Mushak & Crocetti, 1989; Mushak & Crocetti, 1990; Lanphear, Byrd, Auinger et al., 1998a) and food insecurity (and inadequate nutrition) (Fass & Cauthen, 2008; Campbell, 1991). Food security is defined as access by all people at all times to enough food for an active, healthy life, and at a minimum includes having nutritious and safe food and the ability to acquire personally acceptable foods in a socially acceptable way. Many families who are at or below the poverty level experience food insecurity. A 2007 report from the Federal Interagency Forum on Child and Family
Statistics reported 17% of households in the U.S. with children ages 0-17 are food insecure.

**Who is Poor in the United States**

In 2005, close to 13% of the total U.S. population, or 37 million people, were identified as living below the poverty line (U.S. GAO, 2007; U.S. Census, 2007a). There were 12.3 million children, or 17.1% of children under the age of 18 who were counted as living in poverty. Children of color were at least three times more likely to be in poverty than those who were white: 34.2% of children who were African American and 27.7% of children who were Hispanic lived below the poverty line compared to 9.5% who were white. African American children represented 15.2% and Hispanic children represented 19.9% of all children under the age of 18 in 2005. In 2005, 24.9% of African Americans and 22% of Hispanics lived in poverty compared to 8.3% for whites. African Americans made up 12.5% of the total population, while Hispanics accounted for 14.7%.

In 2007, the U.S. poverty rate for children increased to 18%, or 13.3 million, which was a rise of 497,000 children from 2006 (Anderson Moore et al., 2009; U.S. Census, 2007b, 2008b). The percentage of children living in deep or extreme poverty (below 50% of the poverty line) was 8%. Of the 13.3 million children living in poverty, 34.5% were of African American and 28.6% of Hispanic descent, compared with 10.1% of non-Hispanic white children and 12.5% of Asian children. Children living in single female headed households were more than five times (42.9%) as likely as children living in households headed by married parents (8.5%) to be living in poverty. When broken down by race and ethnicity, that number translated to 32.3% of non-Hispanic white for children in single-mother households compared with 4.7% for children in married households.
For African Americans, the poverty rate was 50.2% (single-mother households) compared with 11% (married households). For Hispanic children, the poverty rate was 51.4% compared with 19.3%. For Asian children, the poverty rate was 32% compared with 9.7%. Additionally, 21% of children under age 6, while 16% of children age 6 or older live in poor families. Research suggests parents of young children do not earn as much as parents of older children, because they tend to be younger and have less work experience (Douglas-Hall & Chau, 2008; U.S. Census, 2008b). Analyses by the National Center for Children in Poverty (Fass & Cauthen, 2008) compared the relative proportions of children with immigrant and native-born parents who were in poverty in 2005. In all of the six states examined, poverty rates were higher for children with immigrant parents.

**Poor Hispanic Children**

Lead exposure among Hispanic children and adolescents in the U.S. remains a serious health problem. Bernard and McGeehin (2003) reported data from NHANES III (1988-1994) revealed 28% of Mexican-American children 1 to 5 years of age had BLLs $\geq 5 \mu g/dL$ compared with 19% of the non-Hispanic white children. About 42% of the children aged 1 to 5 years with BLLs $\geq 25 \mu g/dL$ and 13% of the same age group with $\geq 10 \mu g/dL$ were Medicaid participants. In another recent study, Morales et al. (2005) analyzed data on 3,325 Mexican-Americans ages 1 to 17 years from the same NHANES III (1988-1994) that assessed demographic and socioeconomic differences in BLLs among the youth. Age, gender, educational attainment of the head of household and family income, age of housing, source of drinking water and indicators of acculturation (i.e., the language spoken at home and generational status) were found to be statistically significant and independent predictors of elevated BLLs in this population. A higher
prevalence of elevated BLLs was found among immigrant children. In multivariate analyses, first-generation Mexican American children (immigrant children) had higher BLLs than third-generation children. A possible explanation for these results is that first-generation children may be exposed to environmental toxins in Mexico through the use of lead-glazed ceramics and home remedies containing lead. These items have been implicated in other studies of lead contamination of Mexican children (Azcona-Cruz, Rothenberg, Schnaas, Zamora-Munoz & Romero-Placeres, 2000; Meneses-Gonzalez et al., 2003; Lopez-Carrillo et al., 1996; Hernandez-Avila et al., 1991). Mexican-American children living in monolingual Spanish-speaking households had statistically significantly higher BLLs than children living in monolingual English-speaking households after controlling for confounding variables.

In their study of the 1999-2004 NHANES, Dixon et al. reported the odds of a BLL \( \geq 5 \mu\text{g/dL} \) for children born in Mexico were 11.69 times those of children born in the U.S. Country of birth was not a significant factor in predicting BLLs \( \geq 10 \mu\text{g/dL} \). Tehranifar et al. (2008) found foreign-born children were five times more likely than U.S. born children to have elevated BLLs after adjustment for housing characteristics and child behaviors in a New York City study of immigrants. Recent residence in a foreign country had a stronger association to lead poisoning. Children who lived abroad six months prior to getting their blood tested were 11 times more likely to have elevated BLLs than U.S. born children with no history of foreign residence prior to the blood screening. The most common foreign countries of birth among children with elevated BLLs were Mexico and countries of the Caribbean and South Asia.
Children in Medicaid and WIC

Families who are poor rely on federal health care programs, such as Medicaid and the Special Supplemental Nutrition Program for Women, Infants and Children (WIC). At the national level, data consistently show, that as a group, young children enrolled in or eligible for Medicaid or WIC are at increased risk for lead exposure (U.S. GAO, 1998a; Zierolds & Anderson, 2004). Three reports from the U.S. Government Accountability Office (GAO) (formerly known as the General Accounting Office) analyzed data from the NHANES 1991-1994 survey. The GAO reports found Medicaid children aged 1 to 5 years were more than three times (9%) as likely to have high levels of lead in their blood as were children not receiving care under Medicaid (3%). Almost 10% of children aged 1 through 2 had BLLs \( \geq 10 \) µg/dL (1998b, 1998c, 1999). For children in the 1 to 5 year old range receiving WIC benefits, the prevalence was 12% (U.S. GAO, 1999). Although Medicaid-eligible children represented about 30% of the NHANES sample, they represented about 60% of the population with elevated BLLs and 83% of the population with BLLs \( \geq 20 \) µg/dL (1998b). In a subsequent analysis of the same NHANES survey, Kaufmann, Clouse, Olson and Matte (2000), reported 93% of children with elevated BLLs \( \geq 20 \) µg/dL were Medicaid eligible.

Kemper, Cohn, Fant, Dombkowski and Hudson (2005) conducted a retrospective, observational cohort study of 5,175 Michigan Medicaid-enrolled children 6 years old and under who had a screening BLL of at least 10 µg/dL between January 1, 2002 and June 30, 2003. The study measured the proportion of children with EBLLs who had follow-up testing and determined factors associated with such care. The study revealed 3,682 (71%) of the children did not have an EBLL during the year prior to the study. Of the 29% that
had an EBLL, children in the 1 and 2 year-old age range accounted for slightly more than half of the all who had elevated BLLs. Most children were Hispanic or nonwhite, lived in urban areas and had high risk of lead exposure.

Data showed the rate of follow-up testing after an abnormal screening BLL was low and children with increased likelihood of lead poisoning were less likely to receive follow-up testing. Most children were Hispanic or nonwhite, lived in urban areas and had high risk of lead exposure. Race and ethnicity and risk of lead exposure were clustered by urban or rural residence. Urban areas had 88.8% of Hispanic and nonwhite children and 96.1 of the children with high risk of lead exposure.

Kurtin, Threrrell and Paterson (1997) analyzed lead screening data on 92,900 Texan children covered by Medicaid during the first 6 months in 1993. The study found 14.3% of children 25-36 months of age, 13% of children 19-24 months of age and 12% of the 37-48 months of age had BLLs ≥10 µg/dL. Nearly 13% of Hispanic children 24-48 month of age, 7.4% of children under 24 months and 7% of children over 48 months had elevated BLLs. Authors of this study report the roles of ethnicity, income and older housing were identified as strong predictors of elevated BLLs. Zierolds and Anderson (2004) analyzed data from 1996-2000 of 52,407 WIC-enrolled children from the Wisconsin Childhood Lead Poisoning Prevention Program. The mean BLL of these children was 7.89 µg/dL in 1996 and ended at 5.29 µg/dL in 2000. These figures were at least 2 µg/dL greater than the mean BLL of the non-WIC children for those years.

Children who are Medicaid-eligible are protected through the Early and Periodic Screening, Diagnostic, and Treatment (EPSDT) service, which is administered by the Centers for Medicare and Medicaid Services (CMS, n.d). EPSDT is a comprehensive
and preventive child health program for individuals under the age of 21. The EPSDT was defined by law as part of the Omnibus Budget Reconciliation Act of 1989 legislation and includes periodic screening, vision, dental, and hearing services. In addition, Section 1905(r)(5) of the Social Security Act (the Act) requires that any medically necessary health care service listed at Section 1905(a) of the Act be provided to an EPSDT recipient even if the service is not available under the State’s Medicaid plan to the rest of the Medicaid population. The EPSDT program was developed as a preventive measure to find disease early and ensure better outcomes. It was implemented to ensure access and effective use of health care resources for Medicaid recipients and parents.

The lead screening requirements under the EPSDT program stipulate all children receive a screening blood lead test at 12 months and 24 months of age. Children between the ages of 36 months and 72 months of age must receive a screening blood lead test if they have not been previously screened for lead poisoning. A blood lead test must be used when screening Medicaid-eligible children. A blood lead test result \( \geq 10 \) µg/dL obtained by capillary specimen (fingerstick) must be confirmed using a venous blood sample.

The state Medicaid agencies are required to inform all Medicaid-eligible persons under age 21 about EPSDT services, including screenings and immunizations. Contracted medical professionals providing the EPSDT health care services are expected under the law to include the screening and immunizations. Despite these federal requirements, a great number of children in or targeted by Medicaid and WIC programs are not being screened for lead. GAO reports (1998b, 1998c, 1999) on data from NHANES III (1991-1994) found 79% of Medicaid children aged 1 through 2 years and 81% of children aged
1 through 5 years did not receive a blood lead test. Wengrovitz (2005), in an Alliance for Healthy Homes analysis of state data, reported about 24% of Medicaid-enrolled children in the 1-2 year old age group received a lead screening test in 2003, which was only a 5% increase in screening from the 1998 GAO report.

The number of Medicaid eligible children under 5 years of age in Nevada who have received blood lead screenings is very low as shown in the reports filed by the State's Medicaid Office with the CMS for Fiscal Years 2005, 2006 and 2007. In FY 2005, the lead screening rate was .66% for 67,903 Medicaid eligible children 5 years and under; in FY 2006, the rate increased to 1% of 69,349 Medicaid eligible children in the same age bracket. The lead screening rate jumped to 4.5% of 69,995 Medicaid eligible children in FY 2007. Table 1 provides more detailed information below.

<table>
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<th>FY2005</th>
<th>EPSDT Eligible</th>
<th># Blood Lead Screenings</th>
<th>Blood Lead Screening % (BLS/total Eligible)</th>
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<td>&lt; 1 Years</td>
<td>14,775</td>
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</tr>
<tr>
<td>3-5 Years</td>
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<td>203</td>
<td>.73%</td>
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<td>Totals</td>
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<table>
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<th>FY 2006</th>
<th>EPSDT Eligible</th>
<th># Blood Lead Screenings</th>
<th>Blood Lead Screening % (BLS/total Eligible)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 Years</td>
<td>16,125</td>
<td>15</td>
<td>.09%</td>
</tr>
<tr>
<td>1-2 Years</td>
<td>25,834</td>
<td>430</td>
<td>1.6%</td>
</tr>
<tr>
<td>3-5 Years</td>
<td>27,390</td>
<td>417</td>
<td>1.5%</td>
</tr>
<tr>
<td>Totals</td>
<td>69,349</td>
<td>862</td>
<td>1%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FY2007</th>
<th>EPSDT Eligible</th>
<th># Blood Lead Screenings</th>
<th>Blood Lead Screening % (BLS/total Eligible)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 Years</td>
<td>16,451</td>
<td>2,008</td>
<td>12.2%</td>
</tr>
<tr>
<td>1-2 Years</td>
<td>26,992</td>
<td>54</td>
<td>.2%</td>
</tr>
<tr>
<td>3-5 Years</td>
<td>26,552</td>
<td>1,054</td>
<td>4.0%</td>
</tr>
<tr>
<td>Totals</td>
<td>69,995</td>
<td>3,116</td>
<td>4.5%</td>
</tr>
</tbody>
</table>

(*From CMS, n.d.)
In the Kemper et al. (2005) retrospective study of Michigan Medicaid-enrolled children, the rate of follow up testing 180 days after an abnormal screening BLL was only 53.9%. The likelihood of follow-up testing was lower for Hispanic or nonwhite children, for children with urban residence and for children with high lead-exposure risk. These findings suggest a lack of connection between federal efforts to eliminate childhood lead poisoning and current lead screening practices. The GAO (1999) cites the inability of federal and state agencies to monitor screening policies, the widespread belief among providers that there is no lead exposure problem in our communities, the need for more reliable, representative data on the prevalence of elevated BLLs and the extent of screening at the state level as some reasons for the low screening rates. Additional reasons given by the GAO for not increasing the rate of lead blood testing for children who are Medicaid eligible, include the scarce number of preventive health care services received by children (only visiting the physicians when they are sick), the lack of reimbursement by most state Medicaid programs for key treatment services and the low return rate of children who require a follow up test, if and when these tests are even offered. The failure of state and federal agencies to provide preventive screenings to this vulnerable population on a consistent basis continues to place children in danger of unidentified EBLLs that may cause irreversible damage to the nervous system and other organs.

The Importance of Primary Prevention

The number of children who are still being exposed to elevated lead levels and the lackluster performance of state Medicaid and federal agencies in screening at-risk children for lead exposure have convinced the American Academy of Pediatrics, the
CDC and other federal agencies to recommend primary prevention as the best way to reduce exposure to lead for children (CDC, 2005b; AAP, 2005; Levin et al., 2008). Primary prevention was recommended by the U.S. Health and Human Services Department's *Healthy People 2010* objectives and also included in the updated *Healthy People 2020*, with objectives for eliminating BLLs higher than 10 µg/dL in children of the U.S. (HHS, 2010)

Primary prevention efforts control or eliminate all lead sources in children's environments before children are exposed. The CDC (1991, 2005), HUD (2000) and EPA (1996b, 2007, 2009) have established guidelines on the prevention of lead poisoning through education (outreach and distribution of literature), the screening of children under six years old and the removal of hazards from housing with leaded paint. Since the 1970s, major lead sources have been removed from the environment through the implementation of enforceable standards for the use of lead in gasoline, drinking water, food, paint and other items by governmental agencies, such as the EPA, HUD, CDC, the FDA and the U.S. Consumer Product Safety Commission (CPSC). The reduction in the use of lead in gasoline in 1972 and the barring of this additive in 1995 by the EPA (1996a; ATSDR, 2007) translated to fourfold reductions in the median BLLs in U.S. children from 1976 to 1991 (CDC, 1994, 2005a; Pirkle et al., 1994; Muntner et al., 2003; Brody et al., 1994). The drinking (tap) water standard for lead, which was reduced by EPA from 50 parts per billion (ppb) to 15 ppb (or 15 µg/L) in 1986, resulted in the prohibition of lead in plumbing solders and fixtures (CRS, 2003). Then, on the recommendation of the National Research Council (NRC) in 1976, the U.S. CPSC finally barred the use of lead additives in paint intended for interior or exterior residential

Previous research (Needleman, 1990,1998; Rosen & Mushak, 2001; Lanphear,1998, 2005; Levin et al., 2008; Silbergeld, 1997; Bellinger, 1995, 2000, 2004; Bellinger & Bellinger, 2006) has identified lead-based paint as the most common high-dose source of lead in children's environments. While researchers of these studies support primary prevention, their research reveals federal agencies continue to practice secondary prevention, which remove leaded paint hazards after a child has been identified with EBLLs (Lanphear, 1998, 2005; Silbergeld, 1997; Needleman, 1990,1998). The recommended primary prevention policy would require permanently eliminating residential lead before a child moves into the home. Total removal of hazards from housing with leaded paint has been almost non-existent due to the daunting economic and technical costs for the solution.

The CDC's Strategic Plan for the Elimination of Childhood Lead Poisoning in 1990 included a plan for permanently removing leaded paint from housing (Needleman,1998), which spelled out a 15-year strategy and four essential steps to eradicate childhood lead poisoning. These steps included an increase of childhood lead poisoning primary prevention programs, abatement of high-risk housing with leaded paint and dust, a reduction of lead from other sources and the establishment of a national surveillance for children with EBLLs. The plan provided a cost-benefit analysis, showing the monetized
benefits far exceeded the costs of abatement. By 1998, the plan had stalled and no real primary prevention efforts were ever undertaken.

**Cost Benefit of Primary Prevention**

Despite the controversies over how best to prevent lead poisoning (i.e., by providing literature, screening of children under six years old or abating housing with leaded paint), cost benefit analyses have shown significant benefits to reducing lead exposures to children (National Business Group on Health, 2010; A Purchaser's Guide to Clinical Preventive Services, 2010). Vergara, Pertowski and Rosenblum (1996) analyzed immediate direct costs of lead exposure to medical and public health services to treat adverse health outcomes. These researchers estimated childhood lead poisoning resulted in 53,400 hospitalization days and $41 million in inpatient treatment costs.

Other researchers showed a reduction in lead exposure yielded economic benefits from avoiding healthcare and special education costs and by preventing decreases in children's IQ. Grosse, Matte, Schwartz and Jackson (2002) quantified economic benefits from reductions in U.S. children's BLLs from 1976 through 1999. Lower BLLs translated to an increase in the IQs of preschool-aged children from 2.2 to 4.7 points higher in the 1990s than it would have been possible had the blood lead distribution observed among U.S. children in the 1970s continued. The study estimated each IQ point raises worker productivity by 1.76 to 2.38%. The economic benefit estimated for each year's cohort of 3.8 million 2-year-old children ranged from $110 billion to $319 billion. This economic benefit translated in discounted lifetime earnings of $723,300 for each 2-year old in 2000 dollars (earnings in future years are converted to present values, using the inverse of compound interest to reflect time preference). In another study,
Landrigan, Schechter, Lipton, Fahs and Schwartz (2002) estimated the present value of economic losses attributable to lead exposure (i.e., diminished lifetime earnings due to reductions in IQ and lower wages) in the birth cohort of 5 year-olds of 1997 was $43.4 billion.

Taxpayers continue to be burdened with longer term costs of special education and lost tax revenues from lower wages to workers with intellectual deficits as a result of childhood lead exposure or lead poisoning. Schwartz (1994a) and colleagues at EPA estimated $6.937 billion per year would accrue in benefits if children's BLLs were reduced by 1 µg/dL, with $5.060 billion of that total being achieved through avoiding future earnings losses for these children (as a result of harmful effects of lead exposure on cognitive ability and educational achievement). Salkever (1995) reviewed Schwartz' work and utilized more recent labor market trends data to show direct effects of IQ and schooling on earnings for children whose BLLs were reduced by 1 µg/dL. The new data increased the $5.060 billion estimates on earnings benefits by $2.5 billion or to a total of $7.560 billion. This and other cost-benefit analyses presented in this section have demonstrated the benefits of preventing children from becoming exposed to elevated lead levels and from permanently removing lead hazards from children's environment. Primary prevention protects children from the harmful effects of lead exposure, and it has positive effects on the rest of the population, as well.

**Local Prevention Efforts**

At the local level, the SNHD (formerly known as Clark County Health District) was awarded a grant from the CDC in 2006 to assess the lead problem in Southern Nevada. The grant created the Childhood Lead Poisoning Prevention Program (CLPPP) and
established a comprehensive, statewide screening, surveillance and primary prevention outreach and education program to eliminate childhood lead poisoning in Nevada. The CLPPP's Primary Prevention Workgroup developed materials (i.e., bookmarks, brochures, and posters) in English and Spanish to disseminate to the general public and Hispanics. These and other materials, such as a list of health care providers, lead information, screening protocols, information about lead screening and clinic, frequently asked questions and information about lead and pregnancy are available on the SNHD's Website under the CLPPP page. PDF versions of journal articles on lead and annual reports, and links to federal agencies are also available on this page.

Although the Primary Prevention Workgroup from the CLPPP program has distributed brochures and bookmarks during health fairs and special screening events, a majority of the Hispanic population has yet to receive consistent information about lead poisoning and its impact on children. Except for a few physicians, medical professionals in this community have not been as concerned about childhood lead poisoning, since lead paint in old housing is not much of an issue in this state (K. Zupnik, personal communication, April 5, 2010).

To increase awareness and the number of children being screened, the Primary Prevention Workgroup focused on pediatricians who work for two medical organizations contracted to provide ESPDT services for Medicaid eligible children. Table 1 from the previous section of this document, listed the number of Medicaid eligible children who received lead screenings during 2005, 2006 and 2007. The screening rates in Nevada for Medicaid eligible children during those years are 0.66%, 1% and 4.5%, respectively (CMS, n.d.). These numbers highlight the low screening rates in the state, signifying
physicians who are responsible for ESPDT services are not executing the screening required by the program for children at 12 and 24 months, or at 36 and 72 months if they have never received such testing.

After receiving approval from key management from these two medical organizations, a renowned expert from Harvard was invited to speak to medical professionals in 2007. Much of the material from this taped presentation was made accessible through the Web as a Continuing Medical Education course, which was offered in the fall of 2009 and spring 2010. Participation in both of these offerings was dismal (Keith Zupnik, personal communications, April 5, 2010).

Annual screening rates since 2006 increased in 2007 with a number of initiatives to the medical community but have tapered off this year. The extent of the lead problem in the state cannot be properly assessed until there is a sufficient number of children who have been screened in the north, rural and south areas of Nevada (Keith Zupnik, personal communications, April 5, 2010).

Lead Regulatory Agencies

**Federal Agencies**

Important primary prevention regulations and policies have been established by federal, state and local agencies to protect adults and children from exposure to lead poisoning. Key federal agencies include the EPA, CDC, HUD, FDA, the U.S. Occupational Safety and Health Administration (OSHA), the CMS (formerly known as the Health Care Financing Administration [HCFA]) and the U.S. Consumer Product Safety Commission (CPSC). These agencies collaborate to provide a comprehensive approach to control multiple sources and pathways of exposure to lead (ATSDR, 2007;
Silbergeld, 1997). A description of oversight responsibilities for each agency is provided below and in Table 2:

- **EPA**, established under the Clean Air Act of 1970, sets national standards for air quality and emissions of hazardous air pollutants (such as lead) and regulates motor vehicle fuels and fuel additives (EPA, 2008, 2010b). Additionally, the agency sets standards for lead levels in drinking water, dust and soil and publishes information about lead, lead paint hazards, lead poisoning and abating lead-based paint. EPA (2010a) provides grants to fund lead poisoning prevention activities in local communities and across the nation.

- The **1988 Lead Contamination Control Act** authorized CDC to make grants to state and local agencies for comprehensive programs to prevent lead poisoning among children (CDC, 1991). The CDC provides technical assistance for lead poisoning prevention programs to state and local health departments, conducts surveillance of children's BLLs, provides technical guidance to states for blood lead surveillance, conducts applied research on the effectiveness of interventions for primary prevention of lead poisoning and provides a reference laboratory for blood lead surveillance and research studies (CDC, 2010b). The CDC’s Childhood Lead Poisoning Prevention Program (CLPPP) has been committed to the Healthy People goal of eliminating EBLLs in children by 2010 (HHS, 2000) and its updated version, Healthy People 2020.

- The **Lead-Based Paint Poisoning Prevention Act of 1971** authorized HUD (2010a) (ASTDR, 2007) to eliminate levels of lead in paint in federally financed and subsidized housing and in renovations of Public and Indian housing. Subsequent
amendments of 1973, 1978 and 1987-88, and the amendment of the National Consumer Information and Health Promotion Act of 1976, expanded HUD's responsibilities to include nonfederal residences, an extensive research and demonstration program, and a new definition that identified intact (rather than peeling) leaded paint as an immediate hazard. The 1992 Title X (HUD, 2010b; EPA, 1992) amendment emphasized prevention and controlling lead-based paint hazards, while addressing lead-contaminated dust and soil. HUD, the EPA, the Department of Health and Human Services (with CDC and CMS) and the Department of Labor's Occupational Safety and Health Administration (OSHA) have primary responsibility for disseminating the mandates of Title X. Additionally, HUD and EPA collaborate to develop regulations and regulatory guidance for control of lead hazards in housing.

- The FDA protects the public health from potential risks of lead exposure by ensuring food ingredients and packing materials are safe. The Federal Food, Drug, and Cosmetic Act (FFDCA) of 1906 provides FDA with broad regulatory authority over food that is introduced or delivered for introduction into interstate commerce. Under the FFDCA, manufacturers are responsible for producing safe, wholesome and truthfully labeled food products, including bottled water products. Lead appears on the FDA's list of poisonous and deleterious substances, which was established to control levels of contaminants in human food and animal feed. The FDA (2000) bans, recalls or removes consumer goods from the market that contain substances from this list. In 1993, the FDA established an action level for lead in fruit beverages (80 µg/kg) packaged in lead-soldered cans, then in 1995, it banned the use of lead on soldered cans (2004b). The FDA established standards for dietary supplements
(1994), bottled water (2009; 21 CFR §165.110 [1997]), and lead foil capsules (21 CFR§189.301 [2005]) on wine bottles; the lead foil capsules on domestic and imported wine bottles were officially banned by the U.S. in 1996. The FDA (21 CFR§184 [2005]) has determined a group of direct human food ingredients to be "generally recognized as safe" (GRAS). Some of these ingredients contain allowable concentrations of lead ranging from 0.1 to 10 ppm (FDA, 2004a). In 2006, the FDA reduced the action level of lead in Mexican candies to 0.1 ppm (2006a, 2006b). The agency began requiring Mexican-style candies to meet the provisional total tolerable intake level (PTTIL) for lead. The PTTIL sets the total daily lead intake from all sources to be less than 6.0 µg per day for children under six years of age (FDA, 2006a). The FDA also updated its Guidance for Industry: Lead in Candy Likely to be Consumed Frequently by Small Children: Recommended Maximum Level and Enforcement Policy (2006b). These preventive actions have resulted in a considerable decrease in the dietary lead exposure for the general population and vulnerable subpopulations.

- The U.S. Occupational Safety and Health Administration (OSHA) (Department of Labor) sets permissible exposure limits (PEL) (or concentrations) of lead in air in the workplace. The first lead standard was set in 1971 at 200 µg/m³ of air (OSHA, 2010c), which had to be achieved by engineering (i.e., using a vacuum to remove lead dust) and work practice controls (i.e., no eating or drinking in areas where lead dust is present). OSHA later revised the general industry standard in 1978 by lowering the PEL to 50 µg/m³ and adding provisions that required employers to provide medical surveillance, medical removal protection (MRP), hygiene facilities, appropriate
### Table 2
Federal Agencies and Regulations Regarding Lead in the Environment*

<table>
<thead>
<tr>
<th>Agency</th>
<th>Media</th>
<th>Level</th>
<th>Regulation or Recommendation</th>
<th>Reference</th>
</tr>
</thead>
</table>
| Centers for Disease Control and Prevention  | Blood                        | 10 µg/dL       | • Action level for children  
• Recommendation that states develop a method of identifying and testing lead poisoned children  
• Recommendation that states test BLLs in children  
• Childhood Lead Poisoning Program-eliminate childhood lead poisoning through policies, education, funding and research | (CDC, 1991)        |
| CDC (CPSC)                                  | Paints and surface coatings  | 90 ppm         | • Defines lead-containing paint  
• Except for motor vehicles and boats applications, if a paint exceeding this limit is applied to an item intended primarily for children under 12 years of age, the item becomes banned hazardous product. | (CSPC, 2009b)     |
| EPA                                         | Air                          | 0.15 µg/m³     | • National Ambient Air Quality Standard  
• three-month average | (EPA, 2008)        |
| EPA                                         | Water                        | 15 µg/L or 15 ppb | • Action level for public drinking water  
|                                             |                              |                |                                                                                             |                    |
| EPA                                         | Dust-Floors                  | 40 µg/ft²      | • Residential Lead Hazard Standard  
|                                             |                              |                |                                                                                             | (EPA, 2001)       |
| EPA                                         | Dust-Interior Window Sills   | 250 µg/ft²     | • Residential Lead Hazard Standard  
|                                             |                              |                |                                                                                             | (EPA, 2001)       |
| EPA                                         | Residential Bare Soil-Children's Play Area | 400 ppm | • Residential Lead Hazard Standard  
|                                             |                              |                |                                                                                             | (EPA, 2001)       |
| EPA                                         | Residential Bare Soil-non Play areas | 1200 ppm | • Residential Lead Hazard Standard  
|                                             |                              |                |                                                                                             | (EPA, 2001)       |
| EPA                                         | Lead-Based Paint Hazards     | >10 ft²        | • Definition of paint in "fair" or "poor" condition  
Deteriorated paint (exterior surface) or >2 ft² deteriorated paint  
<p>|                                             |                              |                |                                                                                             | (EPA, 2001)       |</p>
<table>
<thead>
<tr>
<th>Agency</th>
<th>Media</th>
<th>Level</th>
<th>Regulation or Recommendation</th>
<th>Reference</th>
</tr>
</thead>
</table>
| Food and Drug Administration  | Food and Packaging                         | (interior surface) Various-0.1 to 10 ppm | • Action levels for foods  
• Handles ingredients and packaging materials                                                  | 21 CFR 184 (FDA, 2000)  
21 CFR 146 (FDA, 2004) |
<p>| FDA                            | Fruit Juices/ Beverages                    | 80 µg/kg                      | • Action level for fruit beverages packaged in lead-soldered cans                                | 21 CFR 146 (FDA, 2000)         |
| FDA                            | Foods Packages in Lead-Soldered Cans       | 250 µg/kg                     | • Action Level                                                                   | (FDA, 2000)                   |
| FDA                            | Ceramic Flatware                           | 3.0 µg/mL                     | • Action Level (leachate, average of six units)                                        | (FDA, 2000)                   |
| FDA                            | Ceramic Hollowware (small)                 | 2.0 µg/mL                     | • Action Level (leachate, any one of six units)                                        | (FDA, 2000)                   |
| FDA                            | Ceramic Hollowware (large)                 | 1.0 µg/mL                     | • Action Level (leachate, any one of six units)                                        | (FDA, 2000)                   |
| FDA                            | Ceramic Cups, Mugs, and Pitchers           | 0.5 µg/mL                     | • Action Level (leachate, any one of six units)                                        | (FDA, 2000)                   |
| FDA                            | Mexican Candy                              | .1 ppm                        | • Recommended maximum lead level in candy                                                  | (FDA, 2006a and 2006b)        |
| FDA                            |                                            | 6.0 µg                        | • Provisional total tolerable intake level (PTTIL) per day for lead by small children       |                                 |
| FDA                            | Bottled Drinking Water                     | 0.005 µg/L                    | • Action Level                                                                     | 21 CFR 165.110                |
| FDA                            | Tin-Coated/Lead Foil capsule Blood         |                               | • Domestic wine considered adulterated/removed from market                                | 21 CFR 189. 301               |
| Center for Medicare and        |                                            |                               | • Administers Medicaid Program, Early and Periodic Screening, Diagnostic, and Treatment    | (CMS, n.d.)                   |
| Medicaid Services (CMS)        |                                            |                               | (EPSDT), requiring state agencies to conduct blood lead screening                        |                                 |
| CMS                            | Lead-Based Paint                           | Test children at 12 and 24 months | • Requires paint testing in federally funded housing                                     | (HUD, 2010c)                  |
| Department of Housing and       |                                            |                               | • Prohibits use of lead-based paint in residential structures built or                     | (HUD, 2010c)                  |</p>
<table>
<thead>
<tr>
<th>Agency</th>
<th>Media</th>
<th>Level</th>
<th>Regulation or Recommendation</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban Development (HUD) HUD</td>
<td>Lead-Based Paint</td>
<td>0.06 % lead by weight in nonvolatile content</td>
<td>rehabilitated by a federal agency or with federal assistance</td>
<td>24 CFR 35</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Definition of lead-based paint manufactured after June 22, 1977</td>
<td>(HUD, 2010c)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>24 CFR 35</td>
</tr>
<tr>
<td>Occupational Safety and Health Administration (OSHA) OSHA</td>
<td>Blood</td>
<td>40 µg/dL</td>
<td>• In occupational exposures, action level--written notification and exam</td>
<td>(OSHA, 2010a)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Removal of employee from exposure</td>
<td>29 CFR 1910.1025</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50 µg/dL</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>50 µg/m³</td>
<td>• The Permissible Exposure Limit (8-hour average) in the workplace</td>
<td>(OSHA, 2010a)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Exposure at or above this action level for more than 30 days per year mandates periodic determination of blood lead levels</td>
<td>29 CFR 1910.1025</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30 µg/m³</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(*Modified from Rothweiler et al., 2007)

- respirators, and air monitoring, among other things. In 1993, OSHA passed an interim final rule to reduce the PEL of occupational exposure to lead for construction industries to 50 µg/m³ (OSHA, 2010b).

- The CMS was restructured in 2001 to reflect the agency's major three lines of business (Healthcare Financial Management, 2001). Of the three centers, one manages Medicare's traditional fee-for-service Medicare program and Medicare Choice plans, while another handles the consumer research and demonstrations, and grievance and appeals functions, and disseminates information on Medicare, Medicare Select, Medicare Choice, and Medigap options. The third center, the Center for Medicaid and State Operations, deals with insurance-regulation functions and state-administered programs, including Medicaid, the State Children's Health Insurance Program (SCHIP), and the Clinical Laboratory Improvements Act (CLIA). This center manages the Early and Periodic Screening, Diagnostic, and Treatment
(EPSDT) service, which is Medicaid's comprehensive and preventive child health program for individuals under the age of 21 (CMS, n.d.). EPSDT includes periodic screening, vision, dental, and hearing services. The program is designed to assess the child's health needs through initial and periodic examinations and evaluations as a way to diagnose health problems earlier before treatment becomes complex and costly. EPSDT requires all children receive a blood lead test at 12 months and 24 months of age, or at 36 months and 72 months of age if they have not been previously screened for lead poisoning. A blood lead test result equal to or greater than 10 µg/dL obtained by capillary specimen (finger stick) must be confirmed using a venous blood sample.

- The U.S. Consumer Product Safety Commission (CPSC) is charged with protecting the public from unreasonable risks of serious injury or death from thousands of types of consumer products under the agency's jurisdiction. In 1976, the CPSC barred the use of lead additives in paint intended for interior or exterior residential surfaces (CPSC, 1978). Through the Lead Contamination Control Act of 1988, the agency was mandated to ban drinking fountains having a lead-lined tank, which were considered imminently hazardous. The Act also required EPA to certify testing laboratories and provide for coordination by the CDC of grants for additional lead screening and referral programs for children and infants. Under the 2009 Consumer Product Safety Improvement Act (CPSIA), the agency (CPSC, 2009b) set new limits for the lead content in children's products and the amount of lead in the paint used on those products.
State and Local Agencies

Federal agencies work with state and local health government agencies to address the childhood lead issue. The Nevada State Health Division has primary responsibilities regarding public health issues in Nevada. Fourteen counties, which are mostly rural, receive public health services from the State health division, while three other counties (Carson, Clark and Washoe) have their own county health authorities. In 2006, the SNHD received a CDC grant to assess the lead problem in Southern Nevada and establish a Childhood Lead Poisoning Prevention Program (CLPPP). The program would develop a comprehensive, statewide screening, surveillance and primary prevention outreach and education program to eliminate childhood lead poisoning in Nevada. In December of the same year, the Southern Nevada District Board of Health and the Nevada State Board of Health approved a proposed regulation that mandated all positive BLL screening results collected in Clark County, Nevada to be reported to the SNHD. Since there was no state legislation requiring blood lead results be reported in other jurisdictions in the state outside of Clark County, the Legislative Workgroup for the CLPPP collaborated with state legislators in preparation for the 2009 legislative session. In May 2009, a Nevada legislation was signed into law, requiring the following: (1) the State Department of Health and Human Services to encourage health care providers to test children for elevated blood levels in accordance with CMS guidelines; (2) preliminary BLL results of 20 ug/dl or higher to be confirmed by a venous blood draw; and (3) laboratories to submit all BLL testing results conducted on children to the appropriate health authority in accordance with regulations adopted by the State Board of Health. This last section allows the State Board of Health to adopt regulations to specify
the method of reporting and the contents of the reports. The law went into effect on October 1, 2009.

That same month, another legislation was signed into law to allow the Southern Nevada District Board of Health to adopt regulations relating to health hazards. Potentially, this law will allow the SNHD to write Healthy Homes regulations for abating nuisances, such as rats, mosquitoes, flies, etc. on residential properties, rental dwelling units, and commercial properties. Such regulation not only deals with abatement of lead in housing but allows environmental investigations of biological, physical or chemical exposure conditions or public nuisance considered a health hazard.

Prior to the regulation mandating laboratories to submit reports on all positive BLL screening results, the SNHD received voluntary reports of BLL screenings. Of the 2,411 reports received between August 2004 and May 2005, 510 of them showed BLLs between 1 µg/dL and 9 µg/dL, while 37 reports showed BLLs ≥ 10 µg/dL, the CDC’s action level (SNHD, 2007). The SNHD Childhood Lead Poisoning Prevention Program Interim Report *In Nevada, Children Run Better Unleaded* (2008) reported a 47% increase in the BLL screenings submitted to the SNHD from 2005 to 2006. During August 2006 through December 2007, Hispanic children accounted for over 50% of the 13 cases with EBLLs above 10 µg/dL (SNHD, 2008). Almost 60% of the children tested were of Hispanic descent.

Table 3 displays data from July 2006 to June 2010 after the regulation mandating laboratories to submit all positive BLL screening results collected in Clark County, Nevada became effective. Race data is not available for the table below, because of current reporting methods. Hispanics were identified through Spanish surnames during
Table 3
Blood Lead Screening Results for Children Ages 0-72 months from July 2006-June 2010*

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>July 2006 through June 2007</td>
</tr>
<tr>
<td>Number screened</td>
<td>4390</td>
</tr>
<tr>
<td>BLL 0 µg/dL</td>
<td>3093</td>
</tr>
<tr>
<td>&gt;0 µg/dL to &lt;5 µg/dL</td>
<td>1218</td>
</tr>
<tr>
<td>≥ 5 µg/dL</td>
<td>79</td>
</tr>
</tbody>
</table>

*Due to limitations by which the blood lead data was recorded from July to September 2006, the age, sex and ethnicity information for approximately 1300 children less than age 7 years who tested with a BLL of 0 is unavailable. These children are not represented in this table but should be taken into consideration when calculating the number of children who demonstrated an exposure to lead versus the total number of children screened.

BLLs ≥10 µg/dL do not appear in a separate category because there were less than 5 cases during this time period. Lead exposure became a reportable condition in Clark County in January 2007. Data before January 2007 only represents the number of blood lead reports received by SNHD but not necessarily the total number of children screened in Clark County. (Data provided by Brenda Argueta, Epidemiologist, SNHD, June 28, 2010)

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>July 2007 through June 2008</td>
</tr>
<tr>
<td>Number screened</td>
<td>9,630</td>
</tr>
<tr>
<td>BLL 0 µg/dL</td>
<td>7,272</td>
</tr>
<tr>
<td>Detectable BLL</td>
<td>2,358</td>
</tr>
<tr>
<td>&gt;0 µg/dL to &lt;5 µg/dL</td>
<td>2,196</td>
</tr>
<tr>
<td>≥ 5 µg/dL to &lt; 10 µg/dL</td>
<td>144</td>
</tr>
<tr>
<td>≥10 µg/dL</td>
<td>18</td>
</tr>
</tbody>
</table>

Only children with confirmatory blood lead results are included. Three children who initially tested with a BLL ≥10 µg/dL are not counted above due to subsequent inconclusive blood lead results. (Data reported in the Childhood Lead Poisoning Prevention Program 2007-2008 Annual Report listed in the CLPPP Webpage of SNHD Website.)

<table>
<thead>
<tr>
<th>Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 2008 through June 2009</td>
</tr>
<tr>
<td>Number screened</td>
</tr>
<tr>
<td>BLL 0 µg/dL</td>
</tr>
<tr>
<td>Detectable BLL</td>
</tr>
</tbody>
</table>
>0 µg/dL to <5 µg/dL  2,107  1,085  1,014  8
≥5 µg/dL and < 10 µg/dL  192  104  85  3
≥10 µg/dL  15  5  10  0

*Of all target-aged children screened this year, racial data was only reported from laboratories for approximately 5% and zip code data was only reported for 31% of children.

(Data reported in the Childhood Lead Poisoning Prevention Program 2008-2009 Annual Report listed in the CLPPP Webpage of SNHD Website.)

<table>
<thead>
<tr>
<th>Gender</th>
<th>Total</th>
<th>Male</th>
<th>Female</th>
<th>Unknown</th>
</tr>
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<tbody>
<tr>
<td>Number screened</td>
<td>11,041</td>
<td>5,659</td>
<td>5,281</td>
<td>101</td>
</tr>
<tr>
<td>BLL 0 µg/dL</td>
<td>9,159</td>
<td>4,740</td>
<td>4,406</td>
<td>13</td>
</tr>
<tr>
<td>&gt;0 µg/dL to &lt;5 µg/dL</td>
<td>1,660</td>
<td>808</td>
<td>786</td>
<td>66</td>
</tr>
<tr>
<td>≥5 µg/dL and &lt; 10 µg/dL</td>
<td>204</td>
<td>103</td>
<td>79</td>
<td>22</td>
</tr>
<tr>
<td>≥10 µg/dLs</td>
<td>18</td>
<td>8</td>
<td>10</td>
<td>0</td>
</tr>
</tbody>
</table>

*Only children with confirmatory blood lead results are included. All data is provisional. Children with BLLs ≥10 µg/dL are counted during the month they were identified regardless of whether they were identified during their first or subsequent tests. Totals include venous and capillary test results except for BLLs ≥10 µg/dL which are all confirmatory. Children with capillary test results ≥10 µg/dL and confirmatory venous testing below 10 µg/dL are classified under that lower BLL. If no confirmatory testing was performed for a child, then that child was classified as having a result of zero. This occurred with a total of 8 children. (Data provided by Brenda Argueta, Epidemiologist, SNHD, August 16, 2010.)

2006-2008, while zip code data is only reported for a small percentage of children tested. The CLPPP will need to continue to work with local laboratories to develop a blood lead lab reporting form that collects the appropriate demographic information.

Even though the program’s primary activities were initiated in Clark County, there are plans for the CLPPP to be expanded throughout Nevada. Key members from the north and rural areas have been invited to participate in the semi-annual Strategic Advisory Coalition meetings by conference call and provided with vital information. The goal of the CLPPP is to establish statewide screening and outreach activities appropriate for all geographic areas. Lack of funding has, thus far, limited the expansion.
The CLPPP's Primary Prevention Workgroup has developed promotional materials in English and Spanish for outreach to the Hispanic and other special populations. The materials have been distributed during health fairs, the SNHD lead clinic and other special screening events. Although a marketing plan has driven many of the health promotion decisions, a more comprehensive cycle of publicity about lead poisoning prevention is scheduled to begin after completion of this study. The systematic and long term communications campaign being planned for the Hispanic community will alert the population about the risk of lead poisoning from cultural practices. Because much of our cultural identity revolves around significant foods and processes associated with eating and drinking, the campaign's messages will focus on cultural values, food habits and the health beliefs that place children at risk. This campaign to change culture-bound behaviors may elicit resistance from some Hispanics.

The CLPPP is being absorbed by a much more encompassing program called Healthy Homes. In 2009, UNLV partnered with SNHD in a HUD Healthy Homes capacity-building grant to establish a network of trained workers who will be able to investigate physical, chemical and biological home hazards, including lead poisoning. Over 100 individuals from local agencies, cities and county government and the university have been trained during the first two Healthy Homes workshops provided in 2010. Some of them have become certified in this area. This diverse group of trained individuals has continued to meet on a regular basis to develop a strategic plan for the Healthy Homes initiative along with policies and procedures, forms and promotion materials.

The group's goal is to submit an application for a subsequent HUD Healthy Homes grant, which becomes available in 2011. The new grant would fund investigation and
remediation of homes with health hazards. Funding is clearly needed for homeowners who live in the older homes most typically affected by health hazards. This grant would sustain important efforts related to abating environmental toxins and other health hazards affecting families and children, and seniors in low-income communities. Publicity about this program will be an essential component in identifying homeowners who need assistance in remediation of health hazards. Additionally, physicians, social workers and social services agencies will be essential to referring individuals whose homes may affected by health hazards (i.e., mold, asbestos or lead, etc.), so the team may investigate for culprits in these hazards. Educational materials have been developed for distribution to medical professionals, social agencies and the public at large. For the Hispanic community, a more culturally sensitive communications process will be needed to reach the at-risk populations.

Culturally Sensitive Communications

Hispanic Cultural Characteristics

Greater acceptance of health education messages regarding lead poisoning prevention will be only possible if cultural characteristics of the Hispanic population are also addressed during the communication process. Researchers have reported on a number of Hispanic values and their impact on health practices. Clark's (1970) seminal book about a Mexican American community revealed the group's social cohesion and community spirit, their use of Spanish as the main language, strong family kinship, respect for elders and loyalty, their religiosity, the woman's role in addressing health issues for family and the man's role in leading the family. Hofstede's (1980, 2001) key book on culture defined collectivism, power distance (includes respeto-respect), simpatía, uncertainty avoidance
and masculinity/femininity (gender issues) as cultural dimensions. Other researchers further studied *familismo* (Burk, Wieser & Keegan, 1995) and religiosity and loyalty (Magaña & Clark, 1995) as they relate to Hispanic cultural characteristics. Additional dimensions have been reported but not included in this selection. A description of relevant dimensions that may apply to the lead poisoning prevention communications campaign is provided below:

- **Collectivism**-- Collectivist societies are communal societies characterized by mutual obligations and expectations based on recognized statuses. The focus is on the in-groups, comprised of social units with centralized common goals and common values. Friends and members of the extended family who may provide companionship and help solve problems are assigned an important role. The individual is interdependent of the group (Triandis, 1995). The Hispanics in-group can include family, extended family (in laws, godparents, close friends).

- **Familismo** (familialism)--This cultural dimension defines the Hispanics' strong bond with and attachment to nuclear and extended families. It includes strong feelings of loyalty, reciprocity and solidarity among members of the same family (Clark, 1970). It expresses the importance of friends and extended family in helping to solve problems. The dimension of *familismo* and strong social support positively influenced outcomes of pregnant Mexican American women in three studies (Campos et al., 2008; Balcazar, Krull & Peterson, 2001; Burk et al., 1995). A study of older Mexican immigrants reported that family bond contributed to good health in old age (Ailinger & Causey, 1995).
• **Simpatía** - This concept emphasizes harmony, social acceptance, and social support as cultural ideals (Triandis, Marin, Lisansky & Betancourt, 1984; Triandis, 2004). It expresses the need to smooth interpersonal relationships in which criticism and confrontation are discouraged. In an article about Mexican-Americans, Murillo (1976) reports on the value of manners and courtesy in interpersonal relations. An elaborate and indirect approach will be preferred rather than appear argumentative about a subject and create embarrassment.

• **Masculinity/femininity** (gender issues): Like all cultures, Hispanics have defined roles for men and women. Much has been written about Hispanic men and the assumed cultural expectations for being strong, in control and the providers for their families (machismo) (Clark, 1970; Quiñones-Mayo & Resnick, 1996; Mayo, 1997; Marin & Marin, 1991; Chong, 2000). These stereotypical perceptions of male and female relationships among Hispanics have not been fully documented according to Cromwell and Ruiz (1979), Mayo (1997), Quiñones-Mayo and Resnick (1996) and Amaro (1988). We know, however, in the Mexican American family, the woman of the household diagnoses illnesses and decides when someone outside the family must be called to treat the sick person (Reinert, 1986; Gordon, 1994; Martaus, 1986; Eggenberger et al., 2006). The male head of household has ultimate authority over the treatment plan to be implemented. It is the woman of the house who will prescribe and administer folk medicine for minor ailments (i.e., headaches, mild colds, and stomachaches). Home treatment will be tried first for minor, natural illnesses and decisions about all treatment will be made within the family network (Clark, 1970; Martaus, 1986; Lopez, 2005).
• **Power distance**—Hofstede (1980) first defined this dimension as the measure of interpersonal power or influence that exists between two individuals. All societies have powerful individuals who are recognized for their inherent traits (i.e., intelligence) or because of acquired characteristics (i.e., money, education, etc.) Marin and Marin (1991) explain societies tend to support power differentials between the common population and those with perceived power. In groups of high power distance in the Hispanic culture, powerful individuals are acknowledged through respect (*respeto*), using formal speech (i.e., *Usted* versus *tú*), or a formal designation, such as *Don* or *Señor* for the males or *Doña* or *Señora* for the females, and by the distance kept and deference demonstrated.

Though Hispanics speak a common language, they are from a diverse group of races and ethnicity who hold a set of similar values. First generation immigrants preserve their language and cultural values, and are adamant about teaching these elements to their children. They are more socially conservative regarding divorce, abortion and other social issues (Pew Hispanic Center, 2008). For second, third and fourth generations who have lived longer the U.S., their values increasingly reflect the mainstream culture as shown by Padilla's 1980 study on acculturation of Hispanics. These values and beliefs can often serve as barriers to information being presented, especially when dealing with lead poisoning prevention communication.

**Communication Barriers**

Four general areas of resistance to dealing with cultural sources of lead poisoning were reported by Trotter (1990). These resistance areas include knowledge deficiencies, communication resistance, reinterpretation and incongruity of health explanatory models.
With knowledge deficiencies, problems are created by what people do not know. In communication resistance, problems are created when people refuse to accept the information that has been provided. Reinterpretation occurs when there is a bicultural mixing of beliefs, knowledge and behavior. In other words, the person accepts new information and changes it (reinterprets it) according to cultural values. The last area of resistance evolves from a clash of health/illness explanatory models between the two cultures.

New members of a culture experience the most basic form of knowledge deficit, requiring careful attention of important cultural components. Children and newcomers (i.e., refugees/immigrants) must learn a complex language, new rules of behavior, different types of foods and about new sources of information. Any significant health education effort must provide information targeted at audiences who have been unexposed to the new culture and must have a component directed to childhood audiences to help transfer knowledge to the next generation (Trotter, 1990; Oomen, Owen & Suggs, 1999; Huerta & Macario, 1999; Jordan, Lee, Hampton & Pirie, 2004).

Communication resistance is considered the broadest category of barriers affecting delivery of health care and health education. This category defines the inability of people to hear or understand information due to differences in language within and between cultures (Trotter, 1990; Jordan et al., 2004). It could include the willful process of not listening to, refusing to understand or unwillingness to believe information that is available. Lack of understanding could evolve from the use of different languages about health and illness, such as when a physician uses medical talk instead of talking to his patient in plain English. An example of communication resistance is evident in Trotter's
ethnographic 1990 study of a Mexican American community in the Lower Rio Grande Valley. Trotter found respondents were aware the clay drinking vessels (jarros) and bean pots (casuelas) were potential sources of lead poisoning. Even knowing the consequences, these individuals preferred cooking their food in Mexican clayware pots, saying the food tasted better than food cooked in other types of pots.

Health education efforts to overcome a refusal to hear or understand the message (psycho-social resistance) demands a different approach than just responding to a linguistic problem. The persons using these vessels may not be concerned about their welfare, but they may be more willing to change their behaviors if an appeal to familismo is made to save their children from being poisoned by lead. In the communication to the Mexican American community, the focus should be in preserving the health and wellness of the children through prevention practices.

Linguistic problems, such as the inability of people to hear or understand information due to differences in language within and between culture or the use of different languages about health and illness (i.e., physician use of medical talk as compared to a plain English explanation), are easier to overcome (Trotter, 1990; Clark, 1970, pg. 221; Brown et al., 2002; Arguijo-Martinez, 1978). Although Spanish is spoken by Mexicans, Cubans, Guatemalans, Puerto Ricans, etc., there are some minor differences in words and expressions used by each group. Translation of documents for the Hispanics in Southern Nevada (whose primary group is comprised of Mexicans) will be made primarily by someone who is skilled in that language and culture. The materials developed will have easy-to-understand and simple language, without jargon or colloquialism or technical
words. It will be a translation that Hispanics from all countries can understand, but the focus will be for Mexican Americans.

Information is often reinterpreted when it moves between cultures (Baca, 1969; Acosta Johnson, 1964). Trotter, in his 1990 study, further revealed cultural reinterpretations (mixing of beliefs, knowledge and behavior) allowed certain individuals justify the use of folk remedy, which exposed risking their families to lead. An owner of an herb shop where *greta* was sold was aware this folk medicine had lead. Many of his clients knew *greta* was harmful, too. The owner claimed the lead affected Anglos but not Mexicans. Mexicans, he said, have adapted to the lead through generations of use and could experience high doses without being harmed. Trotter reported the herb shop owner had knowledge about adaptation and natural selection theories, which he then reinterpreted to justify his resistance to attempts at changing his cultural tradition. More than simple education is needed for this type of communication resistance. Elements of the interpretation will need to be tied to other cultural assumptions to show the need to modify the belief. The new belief is then connected to the existing cultural knowledge. The lead prevention campaign being developed by this author for the Hispanic community will not address this type of communication resistance.

Communication can be further obstructed by incongruity of explanatory models between cultures (Trotter, 1990; Klineman & Benson, 2006; Oomen et al., 1999; Padilla & Villalobos, 2007). Klineman and Benson (2006) define health explanatory models as the beliefs, explanations and behaviors a particular culture holds in relation to any given illness episode. Hispanics with folk beliefs who use folk medicine define a digestive disorder as *empacho*. The folk explanatory model for *empacho* explains this illness as
being caused by a ball or collection of undigested food that sticks to the wall of the digestive tract, producing stomachache, distention, diarrhea and vomiting (Mull & Mull, 1983; Baca, 1969; Martinez & Martin, 1966; Foster, 1953). Folk treatments most often reported for dislodging the food from the wall of the stomach were rubbing the stomach or rubbing the back, or more precisely, pinching the back (Mull & Mull, 1983; Martinez & Martin, 1966; Holland, 1963). *Greta* and *Azarcón* have also been used to treat this illness.

Incongruity of explanatory models is caused by Hispanics following cultural beliefs and behaviors, not by lack of knowledge. Conflicts between folk beliefs and scientific medical practice can lead to fear and rejection of proposed health education messages. Therefore, it is important for the communication campaign to acknowledge the positive elements of the explanatory model for *empacho*, such as rubbing the stomach and back with oil. At the same time, the campaign will explain the risk of poisoning the children by using *greta* or *Azarcón*. For print media or radio interviews, the author will provide examples of cases where children have been poisoned by folk remedies and the repercussion of such behavior.

As these cultural characteristics reflect, it is essential to focus on a message that engages the whole family in guarding the health and welfare of the child or children (collectivism/ *familismo*). The mother's role in keeping the family (i.e., child/ren) safe from lead poisoning will be emphasized through the education message, recommending the use of safe herbal tea (i.e., chamomile or mint) and folk treatment using oil to massage the stomach and back. The message will compliment the mother for keeping powdery substances, such as *Azarcón* and *greta* away from the home.
Source credibility will be important in breaking down communication resistance to primary prevention educational messages to the Hispanic community. In a random sample of 460 Hispanics residing in the San Francisco Bay Area, Marin and Marin (1990) conducted a phone interview of respondents regarding credibility of sources information about AIDS. Of the 16 sources from which to select, there were a movie actor, recording artist, a well-known sports personality and others. The majority of the respondents rated sources directly involved with HIV/AIDS as the most credible: a medical doctor received 96%, a clinic counselor was 94% and a person with AIDS was 92%.

The lead poison prevention presentations to the community being developed from this study will appeal to the mothers and elders of the family through the use of respect and simpatía. The presenter will be a bilingual, bicultural individual who is well respected in the community, can speak Spanish, and can identify with the difficulties this population may be experiencing in becoming acculturated to the new culture. It will be important for this presenter to communicate in a style accepted by the audience, which will allow the lead poisoning prevention information to be well accepted by the community.

Representatives from the two Spanish language television networks (Univision and Telemundo) will be contacted about implementing a campaign, where lead prevention information will be provided during the course of several months. Television was selected as a medium for receiving health information in a research of Southern California Hispanics. Ball-Rokeach and Wilkin (2009) compared ethnic differences in health information-seeking behaviors among Hispanics and Anglos from three different communities in Southern California and from a national survey. The two communities of
Mexican American (Southeast L.A.) and Central American (Pico Union) immigrant populations chose television (38.1 and 38.9%, respectively) as top choice for attaining health information. Of these responses, 84% of Southeast L.A. and 85% of Pico Union Hispanics chose Spanish language television. Of the four two choices, Friends and Family (27.4 to 26.9%), Health Professionals (21.7 to 18.3%), and Books and Magazines (13.7% for Southeast L.A.) and Spanish language newspapers (14.3 percent) were selected. Hispanics from Glendale (as compared to the national survey Hispanics) chose Health Professionals (30.5 to 56.4%--Glendale to National), then Friends and Family (19.9 to 31.8%), Internet (17.2% Glendale) to Television (23.7% National survey). Glendale Hispanics had higher education and income levels, and preferred to answer interview questions in English. However, all Hispanics, no matter how acculturated or what income, selected Friends and Family within the top four choices for obtaining health information.

Summary

What We Know From The Literature

Childhood lead poisoning continues to be one of the most important health issues in the United States today. It is a serious illness with potential lifelong negative health effects for children in all socioeconomic strata, but it disproportionately affects poor and minority children. Although childhood lead exposure has declined in the past thirty plus years, the problem is very serious in many communities. The latest estimates from the Centers for Disease Control and Prevention's (CDC) National Health and Nutrition Examination Survey (NHANES) conducted during the 1999-2002 period show 310,000 children (1.6%) aged 1 to 5 years of age were found to have elevated BLLs or BLLs ≥10
micrograms per deciliter (µg/dL) (considered the level of public concern) and another 1.4 million children in the same age group had BLLs of 5-9 µg/dL (CDC, 2005a).

Lead exposure among Hispanic children and adolescents in the U.S. remains a serious health problem. Brody et al. (1994) reported 1% of 1-2 year old Mexican-American children from the NHANES 1988-1994 data had greater than 25 µg/dL BLLs, which was twice the prevalence for non-Hispanic whites. Bernard and McGeehin (2003) studied the same NHANES data which revealed that 28% of Mexican American children had BLLs greater than 5 µg/dL compared with 19% of non-Hispanic white children. Of these children, 42% were Medicaid participants and 13% of children 1 to 5 years of age had BLLs at or above 10 µg/dL. Morales et al. (2005) study of 3325 Mexican Americans showed age, gender, educational attainment of the head of household and family income, age of housing, source of drinking water and indicators of acculturation (the language spoken at home and generational status) were found to be statistically significant and independent predictors of EBLLs in this population. A higher prevalence of EBLLs was found among immigrant children: first generation had higher BLLs than third-generation children. Mexican American children living in monolingual Spanish-speaking households had statistically significantly higher BLLs than children living in monolingual English-Speaking households.

Lead exposure is calculated by measuring levels of the toxic substance in the blood or micrograms per deciliter (µg/dL). The definition of the level of lead exposure where clinical toxicity occurs—childhood lead poisoning—has evolved over the century (Silbergeld, 1997;CDC, 1991, 1997, 2003, 2005, 2007). In the 1960s, the CDC’s level of concern was ≥60 µg/dL. At that level, many children experienced encephalopathy (brain
damage), comma, convulsions, severe abdominal spasms, kidney injury and anemia. The action level changed to $\geq 30 \, \mu g/dL$ in 1975 then dropped to $\geq 25 \, \mu g/dL$ in 1985. In 1991, the CDC once again reduced the level to $\geq 10 \, \mu g/dL$, where it has remained unmoved through challenges from various researchers.

There are no observable symptoms for elevated BLLs, thus blood lead screening becomes an important recommendation for children under six years of age as a way to prevent lead poisoning. Young children absorb lead more easily than adults through the hand-to-mouth behaviors (CDC, 1991, 2005, 2007; ATSDR, 2007a, 2007b). Their growing bodies are more susceptible to adverse effects of lead, which can impact nearly every system in the body. Lead enters the body through ingestion and inhalation of traditional sources, such as leaded paint (i.e., peeling paint chips), dust from the air and soil, and from non-traditional sources such as leaded ceramic/clay ware, Mexican candies, toys, jewelry and folk medicines recommended by family members or healers/sobadores (alternative forms of medicine) (CDC, 2005; ASTDR, 2007a). Elevated BLLs can cause learning disabilities, behavioral problems and, at very high levels, seizures, coma and even death. Lead can accumulate in the blood, bone and other tissues as a result of repeated exposure.

Emerging evidence reveals intellectual deficits occur in children with BLLs under 10 $\mu g/dL$ (Bellinger, 2000; Bellinger & Dietrich, 1994; Bellinger et al., 1991; Bellinger et al., 1992; Dietrich, Krafft, Bornschein, et al., 1987; Dietrich, Berger, Succop, et al., 1993; Leviton et al., 1993; Landrigan, 1989, 2000; Mushak et al., 1989; Needleman, 2004a, 2004b; Needleman & Gatsonis, 1990; Needleman et al., 1990). Lanphear and colleagues (2000) reported lead may be toxic at BLLs lower than 5.0 $\mu g/dL$ in their study of
NHANES III Phase II (1988-1994) data from more than 4,800 children ages 6 to 16 years. Data showed an inverse relationship between blood lead and math and reading scores at BLLs < 5 µg/dL. Each time blood lead concentration increased by 1 µg/dL, there was a drop in mean arithmetic scores, reading scores, in mean scores on a measure of nonverbal reasoning, and in mean scores on a measure of short-term memory. In the Rochester Longitudinal Study, Canfield et al. (2003) showed an estimated reduction of 7.4 IQ points associated with an increase in lifetime mean blood lead from 1 to 10 µg/dL. Bellinger and Needleman (2003) reported a similar drop in IQ points for children whose maximal BLL was < 10 µg/dL. Lanphear, Hornung, Khoury, et al. (2005b) subsequently examined data collected from 1,333 children who participated in seven international population-based longitudinal cohort studies, followed from birth or infancy until 5-10 years of age. This study found an inverse relationship between blood lead concentration and IQ score. The researchers concluded environmental lead exposure in children who have maximal BLL < 7.5 µg/dL is associated with intellectual deficits. These researchers recommend a reduction in the CDC’s action level of ≥10 µg/dL.

Lead has been introduced in the environment through a series of human activities, such as the burning of fossil fuels, mining and manufacturing of pipes, storage batteries and ammunition, to name a few (ATSDR, 2007). Lead was added to gasoline in the 1920s to increase octane rating and decrease ping of large motor vehicles being built. This additive was removed from gasoline in 1996 (EPA, 1996a; ATSDR, 2007), but particles from vehicle exhaust lingered in the atmosphere and later dropped to the ground. House paint before 1950 contained up to 50% lead, but in 1978 the Consumer Product Safety Commission (CPSC) banned its use in residential paint from 0.50 to a legal
content of 0.06% by weight (HUD, 2010b; CDC, 2004). Lead is present in water
distribution systems found in the Northeast and Central regions of the country, due to
leaded soldered piping, which can often leach lead into the water source used by
thousands of people (ATSDR, 2007; Silbergeld, 2004).

Lead is also present in millions of properties built before 1978, which continue to be
the most common high-dose source of lead exposure for young children in the United
States. Jacobs et al. (2002) report there are 38 million housing units with lead-based
paint, down from a 1990 HUD estimate of 64 million. Low-income families
(<$30,000/year) with children under 6 years of age lived in 1.2 million units classified
with significant lead-based paint hazards. Hazards were present in 35% of all low-
income housing and 17% of government-supported, low-income housing. There was
significant deteriorated lead-based paint in 14% of all houses. The researchers found
housing units in the Northeast and Midwest, compared to housing units in the South and
West, had twice the prevalence of hazards. Dust and soil lead levels were above current
standards set by the HUD and the U.S. Environmental Protection Agency (EPA). Dust
lead is the strongest predictor of childhood BLLs (Lanphear, Byrd, Auinger, et al., 1998a;
Lanphear, Matte, Rogers, et al., 1998b; Lanphear, Hornung & Ho, 2005a; Lanphean,
Wright, & Dietrich, 2005c; HUD, 2000, 2010a; Gaitens et al., 2009). Children who live
in this type of housing are at great risk of becoming exposed to high levels of lead from
the dust and soil.

Various environmental sources related to cultural practices have been identified as
culprits in exposing children to lead: imported handmade or glazed ceramic dishes and
pottery, Mexican candies, folk remedies, bathtub tiles, leaded crystal, pewter and brass
dishware and pewter key chains (CDC, 2002a; Baer et al., 1998; Mohamed et al., 1995; Rothweiler et al., 2007; Gorospe & Gerstenberger, 2008; Cabb et al., 2008). Mexicans following cultural practices use clay bean pots in food preparation and clay vessels for hot and cold beverages. In Mexico, locally made glazed pottery remains a significant source of lead exposure for Mexican children (Romieu et al., 1994; Lopez-Carillo et al., 1996; Meneses-Gonzalez et al., 2003; Mexico's Secretariat of Health, 2005; Villalobos et al., 2009). Some leaded glazed pottery is imported to the United States for retail to the immigrants living in the U.S. or is brought back one piece at a time by Mexicans returning from a visit to their country of origin. This pottery is often used at home or given as gifts (Gersberg, et al., 1997).

The California Department of Health Services, the CDC and FDA have released numerous alerts about children poisoned by Mexican candies (Calif. Dept of Health Services, 1993, 1994a, 1994b, 1998, 2001, 2004; CDC, 2002a; FDA, 1995a, 1995b, 2005, 2007, 2008, 2009), folk remedies (CDC, 1981, 1983, 1993b, 2002a; Baer et al., 1998), and jewelry/charms from vending machines and shoe ware (CDC, 2004, 2006a, 2010d). Since 1993, the California Department of Health Services documented more than 1,500 tests of Mexican candy, which showed 25% of the candy had high lead contents from the leaded ink used on the candy's paper wrapper, the leaded glaze from small clay pots holding acidic tamarind fruit candy or unwashed chilies (carrying lead from soil or from other sources into the candy). Mexican candies were the culprit in two lead poisoning cases reported by the CDC (2002a) in California from 1999 through 2000. Candy made of tamarind fruit (candy/ lollipops and ceramic jars), flavored with chili powder (Vero Dulces, Pancho's Hot Orange Jellies, Chaca candy), chocolate flavored
candy (Choco Buttons and Andinetas), and dried fruits were the source of the alerts and recalls issued by the FDA (2005, 2007).

To protect the public, California and other plaintiffs sue 34 companies manufacturing Mexican-style candy. In 2006, a settlement was signed by the two largest culprits, a Hershey and a Mars subsidiary and several Vero companies. The other 22 defendants followed in 2007. The settlement required an action level in candy at 100 parts per billion (0.1 ppm) based on an average of the samples of a particular product family from a single lot (compared to the original FDA requirement of .5 ppm). Other restrictions in quality control and packaging, types of salt and chilies used, and audits of manufacturing facilities were implemented. The same year, the FDA reduced the action level for lead in candy to 0.1 ppm, at which time the agency began requiring Mexican-style candies to meet the provisional total tolerable intake level (PTTIL) for lead. The PTTIL sets the total daily lead intake from all sources to be less than 6.0 µg per day for children under six years of age (2006a, 2006b). Not only is Mexican candy a source for lead exposure in children, but folk beliefs, folk medicine and the use of folk healers play a major role in bringing lead into the home.

Researchers believe socio-cultural isolation helps preserve many of the folk beliefs for Hispanics who immigrate to the U.S. (Clark, 1970; Sandler & Chan, 1978; Gordon, 1994; Reinert, 1986; Rodriguez, 1983; Chestney, 1980). Hispanics live in segregated, low income communities away from mainstream Anglo neighborhoods, separated by language differences and limited vocational opportunity. This isolation encourages members of this population to follow cultural values, beliefs and practices which give them a sense of comfort. A large percentage of these Hispanics lack access to healthcare,
insurance and have limited transportation options. Germain (1992) reports the insulated, first-generation Mexican immigrant population manages between 70 to 90% of self-recognized episodes of illness outside the formal health care system. In cases other than acute emergencies, it is likely individuals who are experiencing illnesses have resorted to popular folk systems before they seek professional medical help.

Hispanics consider themselves healthy if they are able to maintain a high level of physical activity and if they are free from persistent pain and discomfort. If they show no outward symptom of disease (i.e., cancer, tuberculosis, or heart disease), they believe to be well and healthy. For Hispanics, disease is based on natural phenomena (a known external factor that produces the illness), the supernatural (from God or the almighty), magical origins (from spells from witches, etc.) and emotional concepts (from strong emotions, such as fear, shame, anger, envy, disillusion, etc.) (Foster, 1953; Currier, 1966; Clark, 1970; Risser & Mazur, 1995). Hispanics also believe in the humoral doctrine—how the basic functions of the body are regulated by four bodily fluids, or humors (Foster, 1953; Clark, 1970; Currier, 1966). These humors have been characterized by a combination of heat or cold with wetness or dryness. Good health is equated to balanced humors, while an imbalance results in illness. In modern folk medicine, the wetness and dryness have disappeared, while the hot-cold syndrome has persisted. This doctrine recommends avoidance of exposure to extreme temperatures as a way to health.

Hispanics believe disease is intertwined with God's control of their personal lives subject to his judgment and justice (Foster; 1953; Samora, 1961; Baca, 1969; Kay, 1977; Chong, 2002; Clark, 1970). Hispanics often perceive events in their lives as supernatural
punishments, castigos, as a result of not behaving properly or not following God's laws. Illness can be interpreted as a punishment or as a suffering or hardship imposed by God. If it is a suffering, it may mean one may have to withstand illness, being poor, separation from loved ones, delinquent children, being an alcoholic, having a mean husband, overall bad luck, etc. Since God creates everything in this world, he also allows illness to occur.

In the Mexican American family, the woman of the household diagnoses illnesses and decides when someone outside the family must be called to treat the sick person (Reinert, 1986; Gordon, 1994; Martaus, 1986; Eggenberger et al., 2006). The male head of household has ultimate authority over the treatment plan to be implemented. It is the woman of the house who will prescribe and administer folk medicine for minor ailments (i.e., headaches, mild colds, and stomachaches). She may seek the advice of an older woman if she needs assistance. Home treatment will be tried first for minor, natural illnesses and decisions about all treatment will be made within the family network (Clark, 1977; Martaus, 1986; Lopez, 2005). During illnesses, family members will rally around the sick person. They may use prayer as a way to appease God during illnesses and in combination with visiting holy places, offering candles and making promises (Samora, 1961; Clark, 1970; Graham, 1979). When the prescribed folk medicine treatment given at home does not work, the sick person will be referred to other lay healers, such as a sobador (masseuse/bonesetter), a yerbero/herbolario (herbalist), or a partera (midwife), depending on the health problem.

Foster (1953) first documented a large number of recognized and named illnesses, which result from a series of emotional experiences. Most common among these illnesses are empacho (stomach ailment), mollera caida (fallen fontanel), mal de ojo (evil
eye), and susto (fright). These folk illnesses have been studied in the Mexican American communities by a number of researchers (Clark, 1970; Mull & Mull, 1983; Baca, 1969; Martinez & Martin, 1966; Martaus, 1986; Eggenberger et al., 2006). The treatment for empacho can often expose children to lead. Although a massage of the stomach and back areas and consumption of herbal teas is typically recommended for empacho, sometimes greta or Azarcón (powdery substances containing up to 96% lead by weight) is given to relieve the discomfort. Children who have been treated with greta and Azarcón have been reported to have EBLLs and many have died (CDC, 1983, 1993b, 2002a; Bose et al., 1983; Baer et al., 1989). In Nevada, Cabb et al. (2008) reported a case of a 3-year-old child who was treated with greta for persistent abdominal pains and diagnosed with an EBBL of 19 µg/dL. The child had been taken to a Hispanic folk healer (curandera) and treated with greta for empacho (abdominal problems).

Although an ample number of studies on curanderismo is available (Alegria et al., 1977; Hamburger, 1978; Clark, 1970; Ness & Wintrob, 1981; Holland, 1963; Mull & Mull, 1983; Padilla, Gomez, Biggerstaff & Mehler, 2001), Higginbotham et al. (1990) report usage of this folk healer in the U.S. is low. Only 4.2% of a sample (Mexican Americans between the ages of 18-74 years) in the 1982-1984 Hispanic Health and Nutrition Examination Survey (HHANES) reported using a curandero, yerbero or other folk medicine practitioner within the 12 months prior to the survey. Preference to using Spanish during the study's interview, less than 8 years of education and fewer than 2 years in the U.S. were associated with the use of a curandero. Recent research (Padilla et al., 2001; Lopez, 2005) suggests a large percentage of the Mexican American population
recognizes curanderos. Curanderismo exists in geographical locations of the U.S. with large Hispanic populations of Mexican descent.

Research about the use of a sobador/masseuse/bonesetter is limited. Three studies reported on the types of treatment provided by a sobador: (1) in one Southwest community (Kay, 1977), the position of sobadora was usually occupied by a woman who gave therapies (i.e., rubbed a pain or fixed a joint) instead of medicines and often treated cases of empacho (stomach illness) or mollera caída (fallen fontanel); (2) in Ciudad Juarez, Mexico (across the border from El Paso, Texas) (Anderson, 1987), the sobador limited his practice to the care of musculoskeletal pain or stiffness and cuts and bruises exclusively, and; (3) in an indigenous Mexican village in the Sierra Norte de Puebla, Mexico (Huber & Anderson, 1996), the sobadores were males, while the much higher status role of the curandera was held by women. Within this community’s sobador hierarchy, the sobador who prayed over bones but did not set them was considered to be far superior than a traditional bonesetter. In Southern Nevada, Mexican American housewives traditionally use sobadoras (female sobadors) for minor ailments (i.e., empacho, fallen fontanel, etc.). Treatment by the sobadora included the use of oil to massage designated areas according to illness (i.e., stomach, back, or arms, etc.) or recommendation to drink herbal teas.

The use of folk remedies and folk healers has been documented by the SNHD. From August 2007 through March 2009 six cases were reported on EBLLs associated with folk remedies or folk healers: two cases involved a curandero/sobador, two cases were associated with folk healers and home remedies (including unknown powder, such as Azarcón and greta) and two other cases reported using home remedy (i.e., such as herbal
tea). Prior to August 2007, the Department of Environmental and Occupational Health of
the University of Nevada Las Vegas' School of Community Health headed was
responsible for investigating EBLLs that were voluntarily reported to SNHD. Findings
from environmental investigations of EBLLs identified 14 cases associated with folk
remedies and/or folk healers (Gerstenberger, 2007). Of this total, three saw a sobadora/
curandera, two used a powder for stomachache identified as greta, and five used home
remedies, such as herbal teas (i.e., mint or chamomile) and over-the-counter medications
Hispanics and studied four social-cultural factors related to Hispanic children's BLLs.
These socio-cultural factors included consumption of Mexican-imported candy, use of
clay ceramic bean pots and gold jewelry from Mexico, and use of folk remedies. Two of
the twenty-three families had greta in their homes with lead concentrations of 330,000
ppm and 910,000 ppm. Approximately 87% (20 out of 23) of the families reported
participating in at least one of the four socio-cultural practices which have been
determined to contain lead.

Studies have revealed the degree to which folk beliefs and practices are accepted
varies with Mexican Americans from generation to generation and is dependent on
education and extent of acculturation (Abril, 1977; Wells et al., 1989; Sandler & Chan,
1978; Clark, 1970). The more educated the Mexican American and the longer the time in
the U.S., the less use of folk medicine.

Hispanic Culture

Greater acceptance of health education messages regarding lead poisoning prevention
will be only possible if cultural characteristics of the Hispanic population are also
addressed during the communication process. Clark's (1970) seminal book about a Mexican American community revealed the group's social cohesion and community spirit, their use of Spanish as the main language, strong family kinship, respect for elders and loyalty, their religiosity, the woman's role in addressing health issues for family and the man's role in leading the family. Later, Hofstede's (1980, 2001) key book on culture defined collectivism, power distance (includes respeto-respect), simpatía, uncertainty avoidance and masculinity/femininity (gender issues) as cultural dimensions. Other researchers further studied familismo (Burk et al., 1995;) and religiosity and loyalty (Magaña & Clark, 1995) as they relate to Hispanic cultural characteristics. Additional cultural dimensions have been reported but not included in this selection. A description of relevant dimensions that may apply to the lead poisoning prevention communications campaign includes: (1) **Collectivism**-- Collectivist societies are communal societies characterized by mutual obligations and expectations based on recognized statuses. An important role is assigned to family, friends and members of the extended family (in-laws and godparents) who may provide companionship and help solve problems (Triandis, 1995). (2) **Familismo** (familialism)--This cultural dimension defines the Hispanics' strong bond with and attachment to nuclear and extended families and strong feelings of loyalty, reciprocity and solidarity among members of the same family (Clark, 1970). (3) **Simpatía** --This concept emphasizes harmony, social acceptance, and social support as cultural ideals (Triandis, Martin, Lisansky, & Betancourt, 1984; Triandis, 2004). It expresses the need to smooth interpersonal relationships in which criticism and confrontation are discouraged. (4) **Masculinity/femininity** (gender issues): Like all cultures, Hispanics have defined behaviors for men and women. Much has been written
about Hispanic men and the assumed cultural expectations for being strong, in control and the providers for their families (machismo) (Clark, 1970; Quiñones-Mayo & Resnick, 1996; Mayo, 1997; Marin & Marin, 1991; Chong, 2000). These stereotypical perceptions of male and female relationships among Hispanics have not been fully documented as noted by Cromwell and Ruiz (1979), Mayo (1997), Quiñones-Mayo and Resnick (1996) and Amaro (1988). However, in the Mexican American family, the woman of the household diagnoses illnesses and decides when someone outside the family must be called to treat the sick person (Reinert, 1986; Gordon, 1994; Martaus, 1986; Eggenberger et al., 2006). The male head of household has ultimate authority over the treatment plan to be implemented. (5) Power distance--Hofstede (1980) defined this dimension as the measure of interpersonal power or influence that exists between two individuals. Marin and Marin (1991) explain societies have powerful individuals as a result of inherent traits (i.e., intelligence) or of inherited or acquired characteristics (i.e., money, education). Societies tend to support these power differentials by providing deferential treatment to those people with perceived power. In groups of high power distance, powerful individuals are acknowledged through interpersonal relationships showing personal respect (respeto) in the manner these individuals are addressed or recognized in public.

Though Hispanics speak a common language, they are a diverse group of various races and ethnicity who hold a set of values. First generation immigrants preserve their language and cultural values, and are adamant about teaching these elements to their children. For second, third and fourth generations who have lived longer the U.S., their
values increasingly reflect the mainstream culture as shown by Padilla's 1980 study on acculturation of Hispanics.

Justification for The Proposed Study

Even with the data provided by local studies, the current status of childhood lead exposure in Southern Nevada as a result of the use of cultural practices in the Hispanic population is unknown (Rothweiler et al., 2007; Gorospe & Gerstenberger, 2008; Cabb et al., 2008). Since no study has been conducted on the cultural practices of Hispanics in Clark County, a focused research about this topic is needed to identify if and how the cultural and dietary practices and use of non-traditional sources may be impacting this community. The demographics of this population and the number of immigrants who have moved to the area makes this research necessary.

From 1990 to 2007, the Hispanic population increased from 83,000 to 511,145 in Clark County, accounting for almost 28% of the County's population (Pew Hispanic Center, 2007). Not reflected in these figures are more than 150,000 to 200,000 undocumented Hispanic aliens estimated to be living in the state in 2005 (Pew Hispanic Center, 2006). About 42% of the Hispanics in Clark County are considered poor (36.5% have incomes at less than 100 to 125% of the poverty level and another 5.5% earn at less than 50% of the poverty level) compared to estimated 11% of the total population who is living in poverty (U.S. Census, 2007a; Pew Hispanic Center, 2008). In 2007-2008, Nevada's Hispanic uninsured population was estimated at 58.7% (354,000) by Families USA (2003) as compared to uninsured whites (26.8%). About 54,000 Hispanic children/youth aged 0 to 18 years of age whose income falls below 100/200% of poverty line are estimated to be uninsured for this time period in Clark County.
The demographic pattern for Hispanics presents further concerns for the prevention of lead exposure. Hispanic immigrants often occupy older housing and suffer prior exposure to lead (Morales et al., 2005; U.S. Census, 2007a, 2007b; Tehranifar et al., 2008). In their study of the 1999-2004 NHANES, Dixon et al. (2009) reported the odds of a BLL ≥ 5 µg/dL for children born in Mexico were 11.69 times those of children born in the U.S. Tehranifar et al. (2008) found foreign-born children were five times more likely than U.S. born children to have elevated BLLs after adjustment for housing characteristics and child behaviors in a New York City study of immigrants. Recent residence in a foreign country had a stronger association to lead poisoning. Children who lived abroad six months prior to getting their blood tested were 11 times more likely to have elevated BLLs than U.S. born children with no history of foreign residence prior to the blood screening. In Tehranifar et al.'s study, the most common foreign countries of birth among children with elevated BLLs were Mexico and countries of the Caribbean and South Asia.

Additionally, statistically significant higher BLLs have been found in Hispanic children living in monolingual Spanish-speaking households than in children who live in English-speaking households (Morales et al., 2005). About 78% of the Hispanic households in Nevada are monolingual Spanish, making this group an important population to study regarding childhood lead poisoning (Pew Hispanic Center, 2007). The lack of language skills and insurance coverage for this population are barriers preventing the children from accessing preventive health care services that include blood lead screenings. The influx of immigrant Hispanic populations from 1990 through 2007, their low education level, and the high number of these Hispanics who are living in...
poverty and without health insurance present an increased risk for children to be exposed to lead.

In summary, Southern Nevada Hispanics (with 47% being Mexicans/Mexican Americans) are at a higher risk of exposing their children to lead. This population has about 42% of their members living at less than 100/125% of poverty level or earning at less than 50% of poverty level (U.S. Census, 2007b, 2008b, 2009a). About 354,000 (58.7%) were listed as uninsured, with 54,000 of the children 0-18 years of age considered to be at less than 100/200% of the poverty level also uninsured. These lower income Hispanics live in older housing and may suffer prior exposure to lead. If they are foreign born, they are five times more likely than U.S. children to have EBLLs. The Spanish-Speaking monolingual households in Nevada are at risk, because statistically significant higher BLLs have been found in Hispanic children who live in these types of households. Lack of language skills present barriers for children to access preventive health care services that include blood lead screening. As demonstrated in the literature review, primary prevention through education and blood lead screening of children are ways to guard our children from becoming poisoned by lead. Since the current status of childhood lead exposure in Nevada as a result of the use of cultural practices in the Hispanic population is unknown (Rothweiler et al., 2007; Gorospe & Gerstenberger, 2008), a focused research about Southern Nevada Hispanics is needed to identify if and how the cultural and dietary practices and use of non-traditional sources may be impacting this community.
Study Assumptions

The following assumptions about knowledge and perceptions of the Hispanic population about lead poisoning, the use of clay pottery and home remedies drive this study:

1. Knowledge regarding the effects of lead exposure in the human body, especially that of children, is limited among the Hispanic population.

2. Knowledge regarding the impact of lead exposure to children from the use of non-traditional sources, such as clay pottery, curanderas/sobadoras, home remedies and Mexican candies is limited among the Hispanic population.

3. The Hispanic population’s low education levels impact the manner in which learning about health topics, such as childhood lead poisoning, takes place.

4. The process of following guidelines to prevent childhood lead poisoning is supported through information provided by healthcare professionals (i.e., physician or nurses), social services personnel and staff from non-profit organizations, and through informal support networks, such as family and friends.

5. An important part of informal learning takes place through personally meaningful contexts, such as in home, family, social support groups, the church, television programs and more.
CHAPTER 3

RESEARCH METHODS

Research Topic and Questions

Despite large amounts of national data on lead and childhood lead poisoning, the current status of childhood lead exposure in Nevada is unknown. In particular, exposure of children to lead as a result of cultural practices among the Hispanic population is poorly understood (Rothweiler et al., 2007; Gorospe & Gerstenberger, 2008; Cabb et al., 2008). This study assessed the types of cultural practices being used by Hispanic populations in Southern Nevada, why these practices are being followed, what this population believes about lead poisoning and the types of prevention messages needed to inform Hispanics about the danger of lead poisoning. The goal is to reduce the number of children who become exposed to lead.

The following research questions drove this study:

(R_1) What are the sources of exposure from cultural practices followed by the Hispanic communities?

(R_2) Who are at risk for lead exposure from the cultural practices followed by the Hispanic communities?

(R_3) What is best approach to prevent the at-risk population from becoming exposed to lead through cultural practices?

Research Design

To assess the use of cultural practices, data was collected using a 61-question survey that was translated into Spanish by a certified translator (See Appendix 1). A bilingual researcher conducted the surveys. Since lead exposure primarily affects children under
the age of 6 years old, the target population for this study included Hispanics, 18 years old or older, who were parents or guardians or who lived in a home with one or more children of that age bracket. Products/items brought by respondents to the survey events to be tested for lead by a SNHD lead risk assessor also contributed to the data about cultural practices (more details provided below).

**Topic Selection**

In the fall of 2007, the Environmental and Occupational Health Department received the UNLV's President’s Research Award 2007 on a research titled *Identifying and reducing lead exposure associated with the use of cultural practices in Southern Nevada Hispanic communities*. This study proposed identifying possible sources of exposure in the Hispanic community in order to develop a method for targeting the high-risk populations with appropriate interventions. Emerging Census data indicate Nevada's rapid Hispanic population growth, characterized by immigrants from Latin and Central American countries and the large numbers of children who live at or below poverty without health insurance, presents further concerns for the prevention of lead exposure. Hispanic immigrants often occupy older housing and suffer prior exposure to lead (Morales et al., 2005; U.S. Census, 2007a, 2009a, 2009b; Tehranifar et al., 2008). Statistically significant higher BLLs (BLLs) have been found in Hispanic children living in monolingual Spanish-speaking households than in children who live in English-speaking households (Morales et al., 2005). About 78% of the Hispanic households in Nevada are monolingual Spanish, making this group an important population to study regarding childhood lead poisoning (Pew Hispanic Center, 2007).
Survey Development

A 61-item survey was developed to collect data about a variety of topics identified during the literature review, such as knowledge and use of cultural practices (folk remedies, healers, ceramic ware, bean pot, Mexican candy), information about lead screening, knowledge and opinion about lead exposure, demographics, and the best way to provide the respondent with prevention information (See Appendix 1). Questions 1 through 7 of the questionnaire confirm if any children six years and under live in the household, if the children have visited Mexico, Central America or South America, if they play with dirt or put dirt in their mouths or if they suffer from empacho (a common stomach folk ailment known to many Hispanics). Folk remedies to treat empacho may contribute to children being exposed to lead, so the next section collected data about five home/folk remedies known to treat this ailment. For each folk remedy listed, additional questions were asked regarding usage, person providing it (mom, grandmother, aunt, or other person) to the child, the location where it was obtained, how often it is used, date last used and availability of the remedy. The folk remedies collected were to be sent to the FDA laboratory for testing. Respondents with samples testing positive would be contacted personally about the results.

Questions 8 -16 of the survey asked about the use of curandera/sobadora (folk doctor), how a curandera/sobadora was first used, who recommended this folk healer, how the ailment was treated by this folk healer, if there was any folk remedy used as treatment, and if a sample is available. Samples collected were to be handled as mentioned above. The last two questions inquired about the types of ailments that prompt a visit to a sobadora/curandera instead of a physician.
Questions 17 - 30 collected data about the child under six years old who lives at the respondent's house, asking if the child had been tested for lead, who first made the suggestion that the child be tested and if any child or children or friends/relatives have been found to have elevated BLLs. Respondents were then asked about the use of pottery, handmade ceramic vessels or plates in cooking, eating or drinking, and, if the pottery and other items had been given as gifts or purchased. A vendor's address was requested if the item had been purchased locally. Subsequent questions delved into the use of a bean pot, how long beans sit in pot before cooking, and if a bean pot was available to be picked up for lead testing (certain food and liquids cooked or stored in leaded ceramic/clay pots or containers leach the lead into foods or liquids, thereby transferring the toxic to unsuspecting individuals). The last two questions asked if any of the family members suck/eat/swallow pieces of clay, mini bean pots or soil (i.e., pica behavior) and the reason for this behavior. Pica (eating unusual substances) has been observed in men, women and children of all ages. Researchers have reported about Mexican women and Mexican immigrants who enjoy eating clay, soil or pieces of glazed pottery (Bruhn & Pangborn, 1971; Shannon, 2003; Erdem et al., 2004; Hamilton et al., 2001; Lopez, Langini & Pita Martín de Portela, 2004). The eating of clay soil and dirt, also called geophagia, has been recognized as a major source of lead for children and for adults. Pregnant females with geophagia have been a conduit for lead to their fetuses.

Questions 31 to 39 inquired about consumption of imported candies and the use of jewelry by children under 6 years of age, if the children placed jewelry in their mouths and where the jewelry was purchased. Respondents were asked to provide a sample of candy or jewelry to be tested for lead.
Questions 40 to 47 of the questionnaire collected responses about how much respondents knew about the effect of lead in the children's body, and their perceptions, beliefs and opinions about elevated BLLs and lead screening. The last section of the survey, Questions 48 to 61, asked about demographics and racial/ethnic background of respondents, their mothers, fathers, guardians, their preferred language (Spanish or English), gender, age, highest level of schooling completed, best way to provide information on lead (i.e., television, radio, printed materials, physicians, etc.), preferred language in which to provide this information, and name and address if interested in receiving results of the lead survey after study is completed.

Each survey was assigned an identifying, unique number to track responses, survey collection sites and dates. Items brought to be tested during the survey and product testing events were linked to the respondent's identifying survey number. Responses to completed surveys were entered into a database, which were later transferred to an Excel sheet. The data on the Excel sheet was prepared and uploaded to the SPSS Version 12.0 analytical package.

**IRB/Facility Approvals**

After completion of the 61-item questionnaire, the Informed Consent Form and Facility Authorization Forms were developed. A certified Spanish translator translated these the questionnaire and other two documents into Spanish. Signatures for the Facility Authorization forms were obtained from three pastors each of Amistad Cristiana Church, Águilas Centro Familiar and Congregación Evangelista Palabra Viva. These documents were attached to the Research Protocol Form for Research Involving Human Subjects and submitted to the Office for the Protection of Research Subjects (OPRS) on December
2007. Included with the OPRS submission were certificates of completion for key persons to conduct the survey and part of the research team. A translated version of the General Release of Liability (to be used when testing products/items for lead during the survey process) and an expanded description of the study's research component were subsequently submitted to the OPRS as requested by their office. The research study was finally approved in May 2008, with a goal to collect up to 300 surveys. The protocol number assigned to this study was 0801-2582.

During 2009, four additional Facility Authorization forms were completed and signed by the pastor of Iglesia Manantial de Esperanza and the executive directors of East Valley Family Services, the Sunrise Foundation and Acelero Training Clark County Head Start. These forms were submitted to OPRS for approval to conduct the survey and product testing events at these locations. Of these four locations, only Iglesia Manantial de Esperanza and East Valley Family Services participated in the study.

**Target Population**

A convenience sampling procedure was used to identify research subjects fitting the target population of Hispanic adults, 18 years old or older, who were parents or guardians or lived in a home where there were one or more children who were aged six years old and under. Amistad Cristiana Church, Águilas Centro Familiar and Congregación Evangelista (C.E.) Palabra Viva were selected as survey collection and product testing sites, because of the Hispanic populations being served. The diverse mix of Hispanic congregants at each of these churches offered an exciting research opportunity. Most of the 200 members of Iglesia Amistad Cristiana are primarily from an indigenous area in Mexico, speak their own native dialect plus Spanish, and are first generation immigrants.
The 4,000 members of Águilas Centro Familiar come from Mexico and various Central and South American countries, with many members from Guatemala. Many are also first generation immigrants. At C.E. Palabra Viva, the 2,000 members originate from Mexico, Cuba, Colombia and other Central and South American Countries. It was expected the diverse mix of Hispanics would provide data rich in variety, which would allow comparison by country of origin.

Collection of Data

Survey and product testing events were scheduled at Amistad Cristiana Church in July and at Águilas Centro Familiar in September 2008. A flyer was developed for each event, inviting congregants to bring ceramic and clay ware, folk remedy and jewelry. To recruit applicants, weekly announcements from the pulpit were made during service, beginning at least two weeks prior to each of the survey events. At Amistad Cristiana only 10 surveys were collected. At the Águilas Centro Familiar, an additional 89 surveys were completed. The third church, C.E. Palabra Viva did not participate in the study as originally planned. The death of the pastor's husband made it impossible to schedule any survey activity. In February 2009, another pastor from a small Hispanic church, Manantial de Esperanza, helped recruit 10 mothers for an additional batch of surveys (for a running total of 109). The remaining surveys were collected during events held at East Valley Family Services (EVFS) sites. EVFS serves Hispanic families with children under four years of age, who are taught communication and parenting skills.

During the 13 survey events held from January through May 2009 at EVFS locations, another 103 surveys were collected for a total of 212. Of the 212 surveys, 211 were considered complete. Two bilingual educators from EVFS helped schedule the survey.
and product testing events at various locations, dates and times. This staff distributed flyers the week prior to each event and contacted participants by phone two nights before each scheduled event. The reminder calls encouraged participants to bring various items to be tested for lead. In spite of reminder calls, attendance was lower at the survey events than was typical for other classes at the facility. There were fewer ceramic and metal items than initially expected by the research team.

Conducting the Survey

During each survey and product testing event, each respondent was provided a packet that contained two copies each of the consent form and General Release of Liability form, and the survey. A unique, tracking survey number was assigned to all documents in the packet. Respondents were asked to sign one set of the Consent and a General Release of Liability forms and keep the other set for their records. Instructions were further given to retain the tracking number in the event any information about the study was needed. Items that were brought to be tested that exceeded the established standards for lead (i.e., plastics, metal, or ceramic) were documented and photographed. Respondents were provided the results of the tests, allowing them to keep items that exceeded established standards. Lead positive items could also be donated to the research team.

It was expected that folk remedy samples would be collected and tested at the UNLV laboratory or sent to the FDA laboratory for further testing. Folk remedies were not brought to these events, although two small bottles with liquids, not considered folk medicine, were collected and tested. At each event, after all completed surveys had been collected, a short presentation about lead poisoning prevention was provided and a
variety of educational materials (i.e., bookmarks and brochures) about lead poisoning were distributed. Instructions to have their children screened for lead were part of the presentation. These education materials were provided at no charge by the SNHD CLPPP staff.

Testing the Products/Items

At each scheduled survey event, two Southern Nevada Health District (SNHD) Environmental Division (ED) lead risk assessors were assigned to conduct lead testing of items/products brought by the respondents. The SNHD received a grant in 2006 from the CDC to implement a Childhood Lead Poisoning Prevention Program (CLPPP) in Southern Nevada. The results reported in this research study will augment data being collected by CLPPP program and evaluated by the CDC staff.

From January to May 2009, SNHD ED Lead Risk Assessors tested over 559 items brought by research subjects to the survey and testing events. From this number, 148 (26.4%) ceramic and clay vessels, one bean pot, toys, clothing with unique appliqués, jewelry, keys and other items were found to exceed lead standards. A table of the items tested was originally developed by SNHD ED staff and summarized by this researcher. It is displayed in Chapter 4 (the results section) of this study.

Instrument Used to Test Products

Items brought by respondents to the survey and product testing events were tested using two handheld Niton XLp 300A series x-ray fluorescence (XRF) analyzers. The Niton XLp 300A series XRF analyzer offers specialized algorithms to test for lead in paint, plastic, metal, dust or bulk (for soils). There is even a Consumer Goods mode to screen for lead in accordance with the Consumer Product Safety Improvement Act.
(CPSIA) of 2008. The XRF analyzer is capable of differentiating between lead on the surface of an object (i.e., paint or glaze measured in µg/cm²) and lead that exists in plastic, metal, fabric or wood (measured in ppm) (Thermo Scientific, 2010). XRF analyzers employ different methods to detect lead. The testing conducted for this study used an XRF with a radioactive isotope source (¹⁰⁹Cadmium) in the instrument that emits gamma rays onto a surface (i.e., fabric, plastic, etc). If lead is present in this substrate (i.e., plastic, metal, fabric or wood), lead reacts by emitting energy (or x-rays) (Figure 1-XRF Excitation Model). These x-rays are then measured, and the amount of lead in an object is reported by the XRF on a screen and stored for downloading to computer file.

The XRF analyzer can be easily operated to take paint and metal readings. Information about the item being tested is entered via a touch screen located at the top of the instrument. Item information could include, but is not limited, to the substrate (plastic, metal, fabric or wood), color and condition of the item to be tested (Thermo Scientific, 2010). The XRF is pressed against the surface to be tested until the proximity button is depressed. Once it is depressed, the trigger is then pulled, releasing the
controlled radioactive beam. A fluorescent x-ray is created when an x-ray of sufficient energy strikes an atom in the sample, dislodging an electron from one of the atom's inner orbital shells and replacing with an electron from one of the atom's higher energy orbital shells. A reading by the instrument is produced within twenty seconds based on the emitted x-ray's signature. The unique fluorescent x-ray energy spectrum emitted by each element tested is identified very quickly by the XRF analyzer.

Before beginning each lead risk assessment, the XRF instrument was calibrated using an XRF Performance Characteristic Sheet provided by Thermo Scientific Corporation with the purchase of the XRF (Jessica Newberry, personal communications, May 10, 2010). The XRF must read a 1.0 mg/cm2 lead paint standard three times to determine if the instrument is operating within the predetermined range of 0.8 mg/cm2 and 1.2 mg/cm2 in accordance with EPA/HUD protocol (EPA, 1997; HUD, 1997). In this study, calibration results were recorded on the XRF calibration sheet at the beginning and end of each risk assessment, and at every four hour interval of each risk assessment. Items recording a positive value were photographed, with photos included as part of the final handwritten and electronic report submitted to the author and to SNHD CLPPP team.

Since the XRF contains a radioactive source, the health of the lead risk assessors was continuously monitored. On a quarterly basis, the dosimeter (required to be worn when operating the XRF) was submitted to a laboratory (Radiation Detection Company, 2011) to assess the level of radioactivity to which the operator has been exposed. Above-the-safe-limit radioactive dosages would require the Lead Risk Assessor to stop using the instrument until his/her levels had reached a safer limit.
Testing of Purchased Items

A component of the grant funding for this study allowed the purchase of additional items being sold in ethnic markets and vending machines throughout the Las Vegas area. Items purchased either mirrored those collected during the survey events or represented items that had been identified through the literature review as culprits in elevating children’s BLLs. Ceramic items were purchased from seven ethnic stores throughout Las Vegas. Fifteen (15) mugs, pots, bowls, and serving dishes were analyzed for lead content. Initial screenings of the pottery and ceramics were conducted by X-Ray Fluorescence (XRF) in Bulk Sample Mode, and were replicated three times per item. Some items were further tested using the FDA Flame Atomic Absorption Spectrometric Determination of Lead Extracted from Ceramic Foodware (FDA, 2011) methodology to examine the lead concentration of leachate from each item. This FDA protocol requires items to be filled with 4% acetic acid for 24 hours at 20-24°C, thereby extracting any lead that is present from the food-contact surface. Samples of the leachate (the acetic acid and any other extracted substance) were then put into a Graphite Furnace Atomic Absorption Spectrometer (GFAAS), and each sample was replicated twice. Results from the XRF and GFAAS analyses are listed in Chapter 4.

Small toys were purchased from vending machines located in 10 stores in Clark County, with four stores in Henderson and six stores in the Las Vegas area. Stores were selected because of their proximity to an ethnic neighborhood or because they were frequented by an ethnic population. Samples were all purchased via vending machines with quarters. Price ranged from $0.25 to $1.00 per item. Vending machines containing only stickers were excluded from sampling. One to five toys were purchased per vending
machine, depending on the number of different toys advertised in the display of each machine. The total sample size of vending machine toys is 68. Duplicate toys were still included in the total sample size. Vending machine toys that were stickers or temporary tattoos were excluded from XRF analysis. The excluded toys were purchased at the Viva Indoor Swap-meet on Charleston Boulevard. XRF analysis included the screening of toy and colored plastic lid of the toy container.

Hypotheses that Address the Research Questions

The following hypotheses were developed to address the research questions previously presented in this document.

(R_1) What are the sources of risk for lead exposure from cultural practices followed by the Hispanic communities?

(H_1) The proportion of respondents who use cultural practices will be greater in children who suffer from a folk illness.

(H_1 Sub_1) The proportion of respondents who use folk medicines (i.e., Azarcón or greta) will be greater in children who suffer from empacho.

(H_1 Sub_2) The proportion of respondents who use a curandera/sobadora will increase if their child suffers from empacho.

(R_2) Who are at risk for lead exposure from the cultural practices followed by the Hispanic communities?

(H_2) Foreign born Hispanic respondents will use cultural practices more often than U.S. born respondents.

(H_2 Sub_1) Foreign born Hispanic respondents will use traditional ceramic ware more often than U.S. born respondents.
(H2Sub2) Foreign born Hispanic respondents will use a traditional bean pot more often than U.S. born respondents.

(H2Sub3) Foreign born Hispanic respondents will admit to pica behavior (sucking or eating clay pieces) more often than U.S. born respondents.

(H2Sub4) Foreign born Hispanic respondents will be uninformed about the effects of lead on the bodies of children when compared to respondents born in the U.S.

(R3) What is best approach to prevent the at-risk population from becoming exposed to lead through cultural practices?

(H3) Respondents will prefer to receive lead prevention messages through a variety of media.

(H3Sub1) Respondents will select most often the television, take-home information from school or from a health professional as preferred methods to receive lead prevention messages.

(H3Sub2) Respondents will select least often the daycare, radio or phone calls as preferred methods to receive prevention messages.

(H4) Respondents will have a preference in the language used to promote the lead prevention messages.

(H4Sub1) Foreign born Hispanics will prefer receiving lead prevention messages in Spanish instead of English.

(H4Sub2) U.S. born respondents will prefer receiving lead prevention messages in English instead of Spanish.

(General Objective) Of the metal, ceramics and plastics products tested positive during special data collection events or of the products purchased in stores and vending
machines throughout Southern Nevada, a higher number of metal products than ceramics or plastic products will exceed standards for lead exposure level.

Power Calculation

A power calculation for comparing two independent samples was performed to identify how many surveys needed to be completed in order to have adequate statistical power to test the aforementioned hypotheses. For this calculation it was estimated the proportion of foreign born Hispanics who might use potentially lead containing cultural practices (i.e., home/folk remedies, curandera/sobadora) to treat conditions such as empacho was as high as 20% and the proportion of U.S. born Hispanics who used potentially lead containing alternative therapies was as high as 5%. For a desired power of 0.80 and given these assumptions, it was determined that an adequate sample size for each group would be 76 for a total study population (N) of 152. Although, 150 surveys were projected for the study to meet the power calculation, there were 212 surveys collected to represent at least 76 foreign born Hispanics.

Expected Outcomes

The following outcomes are expected from the testing of these hypotheses:

1. The number of respondents who use folk medicines (i.e., Azarcón or greta) will be greater in children who suffer from empacho.

2. The number of respondents who use a curandera/sobadora will increase if their child suffers from empacho.

3. Foreign born Hispanic respondents will use traditional ceramic ware more often than U.S. born respondents.
4. Foreign born Hispanic respondents will use a traditional bean pot more often than U.S. born respondents.

5. Foreign born Hispanic respondents will admit to pica behavior (sucking or eating clay pieces) more often than U.S. born respondents.

6. Foreign born Hispanic respondents will be uninformed about the effects of lead on the bodies of children when compared to respondents born in the U.S.

7. Respondents will select most often the television, take-home information from school or from a health professional as preferred methods to receive lead prevention messages.

8. Respondents will select least often the daycare, radio or phone calls as preferred methods to receive prevention messages.


10. U.S. born respondents will prefer receiving lead prevention messages in English instead of Spanish.

Variables

In this study, two independent variables (being a foreign born Hispanic or having empacho (a folk illness)) were measured in terms of their impact the following dependent variables: (1) use of folk medicine, (2) use of curandera/sobadora, (3) use of ceramic ware, (4) use of traditional bean pot, (5) admitting to pica behavior, (6) knowledge about lead poisoning, (7) perceptions about lead poisoning, (8) preference of Spanish language in lead prevention messages and (9) type of media preference in receiving lead prevention messages (i.e., television, take-home information from school, speaking to a
health professional, daycare, radio or phone calls). The literature review of potential factors impacting the use of cultural practices and increasing the number of children with EBLLs points to social economic status and acculturation as potential confounding variables. Respondents who are in the lower socioeconomic level have limited choices in housing, healthcare, health insurance, transportation and where they shop for food. These limitations may steer them to cultural practices, such as a curandera/sobadora, folk medicines or ceramic ware. The shorter the time a respondent has spent in the U.S., the closer the ties to cultural practices followed in the mother country. The longer the respondent has lived in the U.S., the greater use of the new country's practices. The study's results may be impacted by the type of respondent it attracts, whether new immigrants who have not been acculturated by the new country or by respondents who have been in this country for a long time.

Statistical Approach

The majority of survey questions used in this research study yielded categorical data, which offer no intrinsic order or measure of magnitude. Survey questions 41 through 47 were based on a Likert scale and therefore yielded ordinal data. For all statistical testing, a significance level of $\alpha = 0.05$ was used. Pearson $\chi^2$ analyses were performed to test stated hypotheses and identify frequencies among responses to survey questions. A Forced Response Scale was used for Likert Scale questions 41 through 47. The nominal categories were identified as Agree/Disagree, with values of 1 (Agree) and 5 (Disagree). Answers to "Neither Agree nor Disagree" were ignored. Either Pearson $\chi^2$ or Likelihood Ratios were employed when appropriate.
A Mann-Whitney U test compared the mean ranks of Questions 40 through 47, whose data were not normally distributed (having a kurtosis of skew greater than one or less than zero). To prepare for this analysis, responses to the five possible options were identified and assigned a value from 1 to 5 on a per case basis.

Responses to Question 49, asking about country of origin were grouped by U.S. born or as foreign born Hispanic. Individuals claiming to have been born in a Latin American country (i.e., Mexico, Guatemala, Colombia, Peru, etc.) were grouped together as a Foreign Born Hispanic. Responses from the Philippines and Somalia were identified in tables of all analyses.

A stepwise logistic regression was applied to explore the relationship between eleven criterion variables and seven predictor variables. Criterion variables were assigned a 1 (Yes) or 2 (No) values. Criterion variables included: (1) Has the child traveled to Central or South America, (2) Has the child suffered from empacho, (3) Has Azarcón (home remedy) been used, (4) Has a curandera/sobadora been used, (5) Has traditional pottery been used, (6) Is there pica behavior (i.e., swallowed clay/soil, (7) Respondent's gender, (8) Respondent's education level, (9) Respondent's age, (10) Foreign born Hispanic or U.S. born respondent and (11) Respondent's primary language. Predictor variables (also known as Models) were identified as Model 1–Use of home remedy Azarcón, Model 2–Been to Curandera, Model 3–Use of Traditional pottery, Model 4–Use of Bean pot, Model 5–Swallowed Clay/soil, Model 6–Eat Imported candies and Model 7–Lead in household. Model 7 data came from items (made of plastics, metal or ceramics) that tested positive for lead during the XRF analyses at each survey event, which were compared by respondent identification number. Each respondent (i.e., household)
showing an item with lead was identified with a 1. Respondents without items containing lead were classified with a 0.

For all statistical analysis the probability of type I error was restricted to $\alpha=0.05$. The probability of a type II error was restricted to $\beta=0.80$. Data collected in this study were analyzed using SPSS Version 12.

Limitations

This study had a number of limitations, which suggests its results should not be generalized to the entire population of Southern Nevada. Although more than 16 events were held throughout the community to collect surveys, a limited number of individuals (211) agreed to take the survey. The method for recruiting participants was one of convenience and was limited to those Hispanics who attended the churches or the classes of the organizations that agreed to host the study. This group may not be representative of Southern Nevada Hispanic as a whole. In addition, the final sample size of 211 participants is small when compared to the estimated number of Hispanics currently residing in Southern Nevada (U.S. Census, 2007a, 2007b). Also limited was the number of respondents who self reported being born in the U.S. (29) with 21 of them identified as Hispanics.

The survey used to collect data from the convenience sample of respondents was not without limitations. Although the questionnaire was developed and reviewed by the study's team of experts from the University of Nevada, Las Vegas, it was not a validated research tool. Certain shortcomings limited its use during statistical analysis. A more detail analysis of the survey will be provided in Chapter 5.
CHAPTER 4

STUDY FINDINGS

Data Analysis

Demographic Data

Recruitment for this study began July 2008 and ended on May 8, 2009, with 16 survey and product testing events held throughout Las Vegas. A total of 212 respondents consented to participate in the study, while only 211 completed surveys were collected. Of this total, 199 were completed by Hispanics. After surveys had been collected at each event, respondents received a short presentation about the dangers of lead exposure to children aged six or under. The presentation identified ways for avoiding common items containing lead and discussed the benefits of screening children under six years of age for lead. Educational materials (i.e., pamphlets, brochures and a bookmark) developed by the SNHD were also distributed to respondents. Table 4 shows respondents' characteristics as compared to being foreign born Hispanic and U.S. born.

Although the study targeted the Hispanics with children under six years of age, non-Hispanics were allowed to participate during the survey events at East Valley Family Services (EVFS) sites. Enrollment to EVFS programs is open to parents from all races and ethnic backgrounds. In spite of this minor change in the recruiting process, demographic data collected for all events show almost 94.8% (199/210) of respondents were Hispanics and less than 85% (175/207) of the group was comprised of females (includes foreign born Hispanic and U.S. born). Mexico was the country of origin for more than 85% (152/178) of Hispanic respondents, with minor participation from Central
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Foreign Born</th>
<th>U.S. Born</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Race/Ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White, Non-Hispanic (NH)</td>
<td>0</td>
<td>6 (20.0)</td>
</tr>
<tr>
<td>Black/African American - (NH*)</td>
<td>1(0.6)*</td>
<td>1 (3.3)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>178 (98.9)</td>
<td>21 (70.0)</td>
</tr>
<tr>
<td>Asian*</td>
<td>1(0.6)*</td>
<td>0</td>
</tr>
<tr>
<td>Native Hawaiian/Pacific Islander†</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>American Indian/Alaskan Native</td>
<td>0</td>
<td>2 (6.7)</td>
</tr>
<tr>
<td>*(n= 210)</td>
<td>Total 180(100%)</td>
<td>30(100%)</td>
</tr>
</tbody>
</table>

* Somalia

ΦPhillipines

<table>
<thead>
<tr>
<th>Hispanic Respondents' Country of Origin</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexico</td>
<td>152 (85.4)</td>
<td></td>
</tr>
<tr>
<td>Guatemala</td>
<td>12 (6.7)</td>
<td></td>
</tr>
<tr>
<td>El Salvador</td>
<td>8 (4.5)</td>
<td></td>
</tr>
<tr>
<td>Other Latin American Countries</td>
<td>6 (3.4)</td>
<td></td>
</tr>
<tr>
<td>*(n=178)</td>
<td>Total 178(100)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Respondent's Mother Country of Origin</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>164 (77.7)</td>
<td></td>
</tr>
<tr>
<td>Guatemala</td>
<td>12 (5.7)</td>
<td></td>
</tr>
<tr>
<td>El Salvador</td>
<td>9 (4.3)</td>
<td></td>
</tr>
<tr>
<td>Other Latin American Countries</td>
<td>8 (3.8)</td>
<td></td>
</tr>
<tr>
<td>Other Foreign Countries</td>
<td>2 (0.9)</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>3 (1.4)</td>
<td></td>
</tr>
<tr>
<td>*(n=211)</td>
<td>Total 198 (93.8%)</td>
<td>13 (6.2%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Respondent's Father Country of Origin</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>164 (77.7)</td>
<td></td>
</tr>
<tr>
<td>Guatemala</td>
<td>14 (6.6)</td>
<td></td>
</tr>
<tr>
<td>El Salvador</td>
<td>7 (3.3)</td>
<td></td>
</tr>
<tr>
<td>Other Latin American Countries</td>
<td>9 (4.3)</td>
<td></td>
</tr>
<tr>
<td>Other Foreign Countries</td>
<td>3 (1.4)</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>2 (0.9)</td>
<td></td>
</tr>
<tr>
<td>*(n=211)</td>
<td>Total 199 (93.8%)</td>
<td>12 (5.7%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>23 (12.9)</td>
<td>5 (17.2)</td>
</tr>
<tr>
<td>Female</td>
<td>152 (85.4)</td>
<td>23 (79.4)</td>
</tr>
<tr>
<td>Unknown</td>
<td>3 (1.7)</td>
<td>1 (3.4)</td>
</tr>
</tbody>
</table>
Table 4
Respondent's Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Foreign Born Freq. (%)</th>
<th>U.S.Born Freq. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n=207) Total</td>
<td>178(100%)</td>
<td>29(100%)</td>
</tr>
<tr>
<td>Age Group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 – 20</td>
<td>3 (1.7)</td>
<td>5 (17.2)</td>
</tr>
<tr>
<td>21 -24</td>
<td>27 (15.0)</td>
<td>4 (13.8)</td>
</tr>
<tr>
<td>25 – 29</td>
<td>37 (20.6)</td>
<td>4 (13.8)</td>
</tr>
<tr>
<td>30 – 34</td>
<td>42 (23.3)</td>
<td>7 (24.1)</td>
</tr>
<tr>
<td>35 – 39</td>
<td>35 (19.4)</td>
<td>5 (17.2)</td>
</tr>
<tr>
<td>over 40</td>
<td>34 (18.9)</td>
<td>4 (13.8)</td>
</tr>
<tr>
<td>Unknown</td>
<td>2 (1.1)</td>
<td></td>
</tr>
<tr>
<td>(n=209) Total</td>
<td>180(100%)</td>
<td>29(100%)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elementary School</td>
<td>61 (33.5)</td>
<td></td>
</tr>
<tr>
<td>Some high school</td>
<td>65 (35.7)</td>
<td>8 (27.6)</td>
</tr>
<tr>
<td>High School graduate</td>
<td>21 (11.5)*</td>
<td>6 (20.7)</td>
</tr>
<tr>
<td>Some College</td>
<td>15 (8.2)</td>
<td>5 (17.2)</td>
</tr>
<tr>
<td>College Graduate</td>
<td>14 (7.7)○</td>
<td>5 (17.2)</td>
</tr>
<tr>
<td>Graduate School</td>
<td>2 (1.1)</td>
<td>5 (17.2)</td>
</tr>
<tr>
<td>Unknown</td>
<td>4 (2.2)</td>
<td></td>
</tr>
<tr>
<td>* Respondent from Somalia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>○ Respondent from Philippines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n=211) Total</td>
<td>182(100%)</td>
<td>29(100%)</td>
</tr>
<tr>
<td>Language Most Comfortable Speaking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spanish</td>
<td>167 (92.8)</td>
<td>6 (20.7)</td>
</tr>
<tr>
<td>English</td>
<td>6 (3.3)*</td>
<td>14 (48.3)</td>
</tr>
<tr>
<td>Spanish/English combination</td>
<td>5 (2.8)</td>
<td>9 (31.0)</td>
</tr>
<tr>
<td>Unknown</td>
<td>2 (1.1)</td>
<td></td>
</tr>
<tr>
<td>*Includes respondent from Philippines</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Somalian respondent chose different language and other Latin American countries. About 80% (164/211) of all respondents also chose Mexico as the country of origin for their mother and father.

Among the foreign born Hispanic group, 80% (144/178) were at or under 39 years of age compared to 86% (25/29) of U.S. born respondents. The level of education in the foreign born Hispanic group was low. Data showed 69% (126/178) of them had
elementary and some high school education but no high school degree. More than 27% (8/29) of U.S. born respondents self reported completing elementary school and some high school. Almost 8% (14/178) foreign born Hispanics finished college in comparison to 17% (5/29) of the U.S. born respondents. When asked "Which language do you feel most comfortable speaking?" Spanish was reported for almost 93% (167/178) of the foreign born Hispanics and 20.7% (6/29) of the U.S. born respondents. Over one third of the U.S. born group preferred a combination of English and Spanish. Results for another question that asked respondents about their preferred language for lead prevention messages are reported in Table 9.

Table 5 presents the Pearson $\chi^2$ results, comparing the proportion of children who suffered with empacho to four cultural practices as identified by survey respondents. These results show a significant relationship in the proportion of children who had reported to suffer from empacho and from a stomach illness, $\chi^2 (1, N = 189) = 29.024, p < .001$. Children who had empacho were more than 2.1 times as likely to also suffer from a stomach illness, (95% CI, 1.595 - 2.805). In this survey, 8.5% of respondents whose children suffered from empacho also used Azarcón, a folk remedy which contains a high percentage of lead, LR (1, N = 190) =12.044, $p = .001$). Individuals who reported their children as suffering from empacho were 11.6 times more likely to use a curandera/sobadora than those who did not report having empacho (95% CI, 3.900 - 34.576). There was a significant relationship between suffering from empacho and using a curandera/sobadora, $\chi^2 (1, N = 192) = 26.912, p < .001$. 
A Pearson $\chi^2$ test also compared the use of cultural practices by foreign born Hispanic and U.S. born respondents in Table 6. Of 11 variables that were examined by country of origin, only pica behavior (having children or any family members ingest pieces of clay, mini pots or soil) showed a significant relationship, $\chi^2 (1, N = 194) = 5.621, p = .018$. Pica behavior was evident in 30.8% of the foreign born Hispanic and 8% of the U.S. born respondents. Foreign born Hispanics were 5.1 times as likely to have a pica behavior than a U.S. born respondent. Almost 50% of children each from the foreign born Hispanic and U.S. born respondents have suffered from empacho. The use
Table 6
Cultural Practices Identified by Survey Respondents as Compared to Being Foreign Born Hispanic or U.S. Born

<table>
<thead>
<tr>
<th>Cultural Practice / Belief</th>
<th>% Foreign Born Hispanic</th>
<th>% U.S. Born</th>
<th>Pearson $\chi^2$</th>
<th>(p)</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have any of your children ever been in Mexico, Central America or South America?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>50.6</td>
<td>41.4</td>
<td>0.840</td>
<td>.359</td>
<td>1.451</td>
<td>0.653 - 3.227</td>
</tr>
<tr>
<td>No</td>
<td>49.4</td>
<td>58.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have any of your children suffered from stomach illness?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>60.4</td>
<td>46.4</td>
<td>1.911</td>
<td>.167</td>
<td>1.757</td>
<td>0.785 - 3.934</td>
</tr>
<tr>
<td>No</td>
<td>39.6</td>
<td>53.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have any of your children suffered from empacho?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>47.9</td>
<td>48.3</td>
<td>0.002</td>
<td>.966</td>
<td>0.983</td>
<td>0.446 - 2.168</td>
</tr>
<tr>
<td>No</td>
<td>52.1</td>
<td>51.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Which of the home remedies below have you used?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes, Azarcon</td>
<td>3.4</td>
<td>6.9</td>
<td>0.698*</td>
<td>.404</td>
<td>0.474</td>
<td>0.091 - 2.469</td>
</tr>
<tr>
<td>No, Azarcon</td>
<td>96.9</td>
<td>93.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have you or your children been to a curandera/sobadora?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>18.4</td>
<td>10.7</td>
<td>1.099*</td>
<td>.295</td>
<td>1.878</td>
<td>0.534 - 6.604</td>
</tr>
<tr>
<td>No</td>
<td>81.6</td>
<td>89.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does your family use any pottery, handmade ceramic vessels or plates for cooking, eating or drinking?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>38.8</td>
<td>39.3</td>
<td>0.002</td>
<td>.960</td>
<td>0.979</td>
<td>0.431 - 2.225</td>
</tr>
<tr>
<td>No</td>
<td>61.2</td>
<td>60.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you own a bean pot?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>9.6</td>
<td>15.4</td>
<td>0.719</td>
<td>.396</td>
<td>0.585</td>
<td>0.178 - 1.925</td>
</tr>
<tr>
<td>No</td>
<td>90.4</td>
<td>84.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have your children or any family members sucked/eaten/swallowed pieces of clay, mini bean pots or soil?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>30.8</td>
<td>8.0</td>
<td>5.621</td>
<td>.018</td>
<td>5.111</td>
<td>1.16 - 22.5</td>
</tr>
<tr>
<td>No</td>
<td>69.2</td>
<td>92.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do your children eat imported candies?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>68.6</td>
<td>53.6</td>
<td>2.438</td>
<td>.118</td>
<td>1.891</td>
<td>0.843 - 4.24</td>
</tr>
<tr>
<td>No</td>
<td>31.4</td>
<td>46.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
of Azarcón, a home remedy containing high levels of lead, was reported to be double in the U.S. born respondents compared to foreign born Hispanics. On the other hand, foreign born Hispanics reported using a curandera/sobadora at a rate that was almost twice the rate of the U.S. born respondents. The use of traditional pottery was reported to be almost 40% for each group. There was no significant difference in the proportion of children from the foreign born Hispanic and U.S. born respondents who ate imported candies (68.6% vs. 53.6%), wore jewelry (55.9% vs. 51.9%) or placed that jewelry in their mouths (42.7% vs. 46.7%).

In Table 7, a Pearson χ² test was used to compare responses between foreign born Hispanic and U.S. born respondents about knowledge and perceptions of the effects of lead exposure. Respondents were asked to Agree or Disagree with statements on lead exposure effects, starting with survey question 41 through 47. Almost 94.1% of foreign born Hispanic respondents (vs. 88.5% U.S. born respondents) believed an elevated lead level may cause their child to do poorly in school. About 50.4% of foreign born Hispanics and 26.3% of U.S. born respondents believed their child had a high chance of getting elevated BLLs. The difference in the proportion of respondents who agreed with this statement was inconclusive, but should be explored further, χ² (1, N = 212) = 3.814,


Table 7
Respondents' Knowledge/Perception of Lead Exposure Effects As Compared to being Foreign Born Hispanic or U.S. Born

<table>
<thead>
<tr>
<th>Knowledge/Perception</th>
<th>Foreign Born Hispanic</th>
<th>US Born</th>
<th>Pearson $\chi^2$ (p)</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe an elevated blood lead level may cause my child to do poorly in school.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>94.1</td>
<td>88.5</td>
<td>0.942</td>
<td>.332</td>
<td>2.07</td>
</tr>
<tr>
<td>Disagree</td>
<td>5.9</td>
<td>11.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I believe my child has a high chance of getting elevated blood lead levels.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>50.4</td>
<td>26.3</td>
<td>3.814</td>
<td>.051</td>
<td>2.85</td>
</tr>
<tr>
<td>Disagree</td>
<td>49.6</td>
<td>73.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I believe a child with elevated blood lead levels can be a very serious situation.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>97.0</td>
<td>92.9</td>
<td>0.981*</td>
<td>.322</td>
<td>2.49</td>
</tr>
<tr>
<td>Disagree</td>
<td>3.0</td>
<td>7.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I believe a child with elevated blood lead levels cannot be easily treated.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>62.5</td>
<td>55.6</td>
<td>0.319</td>
<td>.572</td>
<td>1.33</td>
</tr>
<tr>
<td>Disagree</td>
<td>37.5</td>
<td>44.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I believe it would be expensive for me to get my child tested for lead.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>52.9</td>
<td>21.7</td>
<td>7.7</td>
<td>.006</td>
<td>4.04</td>
</tr>
<tr>
<td>Disagree</td>
<td>47.1</td>
<td>78.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I believe treatment for my child's elevated blood lead levels would take too much spare time.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>36.9</td>
<td>18.5</td>
<td>3.4</td>
<td>.066</td>
<td>2.58</td>
</tr>
<tr>
<td>Disagree</td>
<td>63.1</td>
<td>81.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I can prevent my child from getting lead poisoning.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>97.6</td>
<td>100.0</td>
<td>1.268*</td>
<td>.260</td>
<td></td>
</tr>
<tr>
<td>Disagree</td>
<td>2.4</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Likelihood Ratio used because cells have expected counts less than 5.

$p = .051$. Furthermore, foreign born respondents were 2.8 times more likely to believe their child had a high chance of getting elevated BLLs than U.S. born respondents (95% CI, 1.0 - 8.14).
The proportion of Agree responses for foreign born Hispanics as compared to U.S. born respondents was significant for question, "I believe it would be expensive for me to get my child tested for lead," (52.9% vs. 21.7%), $\chi^2 (1, N = 212) = 7.7, p = .006$. Foreign born Hispanics were 4.4 times as likely to agree with this statement (95% CI, 1.50 - 10.87). However, about 36.9% of foreign born Hispanics as compared to 18.5% of the U.S. born respondents agreed with the statement, "I believe treatment for my child's elevated blood lead levels would take too much spare time." The difference in the proportion of responses from the foreign born Hispanics as compared to U.S. born respondent was inconclusive but should be explored further, $\chi^2 (1, N = 212) = 3.4, p = .066$. Foreign born Hispanics were almost 2.6 times as likely to agree with this statement (95% CI, 0.94 - 7.06).

Although not significant, the proportion of Agree responses for foreign born Hispanics as compared to U.S. born respondents was similar for questions: "I believe a child with elevated blood lead levels can be a very serious situation," (97.0% vs. 92.9%); "I believe a child with elevated blood lead levels cannot be easily treated," (62.5% vs. 55.6%); and "I can prevent my child from getting lead poisoning," (97.6% vs. 100.0%).

The same seven questions were analyzed using the Mann-Whitney U Test as shown in Table 8. There was a significant difference in the way foreign born Hispanics answered the following questions as compared to U.S. born respondents.

1. "I believe it would be expensive for me to get my child tested for lead,"

   $U = 1687.5, p = .004, r = -.2049$. Foreign born Hispanics had a lower median (Mdn
Table 8
Respondents' Knowledge/Perception of Lead Exposure Effects As Compared to being Foreign Born Hispanic or U.S. Born

<table>
<thead>
<tr>
<th>Hispanic Foreign Born</th>
<th>U.S. Born</th>
<th>(r=Z/√N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median SD</td>
<td>Mean Rank</td>
<td>Median SD</td>
</tr>
<tr>
<td>2.000</td>
<td>102.460</td>
<td>3.000</td>
</tr>
<tr>
<td>1.477</td>
<td>2.128</td>
<td>1.000</td>
</tr>
<tr>
<td>0.962</td>
<td>1.123</td>
<td>3.000</td>
</tr>
<tr>
<td>1.172</td>
<td>1.055</td>
<td>1.000</td>
</tr>
<tr>
<td>0.778</td>
<td>0.985</td>
<td>3.000</td>
</tr>
<tr>
<td>1.304</td>
<td>1.289</td>
<td>1.000</td>
</tr>
<tr>
<td>1.170</td>
<td>1.033</td>
<td>3.000</td>
</tr>
<tr>
<td>1.221</td>
<td>1.282</td>
<td>1.000</td>
</tr>
<tr>
<td>0.724</td>
<td>0.553</td>
<td></td>
</tr>
</tbody>
</table>

Please choose one or more ways from the list below by which children may get lead into their systems.

2. I believe an elevated blood lead level may cause my child to do poorly in school.

| 2.000 | 105.390 | 1.000 | 88.480 | 2131.0 | -1.511 | .131 | -.1055 |
| 0.962 | 1.123 |

I believe my child has a high chance of getting elevated blood lead levels.

| 3.000 | 99.370 | 3.000 | 121.400 | 1989.5 | -1.920 | .055 | -.1344 |
| 1.172 | 1.055 |

I believe a child with elevated blood lead levels can be a very serious situation.

| 1.000 | 105.240 | 1.000 | 96.380 | 2360.0 | -0.837 | .403 | -.0582 |
| 0.778 | 0.985 |

I believe a child with elevated blood lead levels cannot be treated easily.

| 3.000 | 102.160 | 3.000 | 111.710 | 2328.5 | -0.826 | .409 | -.0576 |
| 1.170 | 1.033 |

I believe it would be expensive for me to get my child tested for lead.

| 3.000 | 97.200 | 4.000 | 130.810 | 1687.5 | -2.919 | .004 | -.2049 |
| 1.304 | 1.289 |

I believe treatment for my child's elevated blood lead levels would take too much spare time.

| 3.000 | 97.020 | 4.000 | 131.860 | 1657.0 | -3.037 | .002 | -.2132 |
| 1.221 | 1.282 |

I can prevent my child from getting lead poisoning.

| 1.000 | 104.530 | 1.000 | 90.240 | 2182.0 | -1.381 | .167 | -.0967 |
| 0.724 | 0.553 |

2. = 3) and Mean Rank (97.200) than U.S. born respondents (Mdn = 4 [Mean Rank = 130.810]).
3. "I believe treatment for my child's elevated blood levels would take too much spare time," U = 1657.0, p = .002, r = -.2132. Foreign born Hispanics had a lower median (Mdn = 3) and Mean Rank (97.020) than U.S. born respondents (Mdn = 4 [Mean Rank = 131.860]). Results need to be explored further for question, "I believe my child has a high chance of getting elevated blood lead levels," U = 1989.5, p = .055, r = -.1344. The foreign born Hispanic and U.S. born respondents had similar medians (Mdn = 3 [Mean Ranks: 99.370 vs. 121.400]).

Table 9
Media and Language Preferred for Lead Prevention Messages

<table>
<thead>
<tr>
<th>Preference</th>
<th>Foreign Born Hispanic</th>
<th>U.S. Born</th>
<th>( \chi^2 )</th>
<th>( p )</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Media</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Television</td>
<td>55.3</td>
<td>44.8</td>
<td>1.103</td>
<td>.294</td>
<td>1.52</td>
<td>0.69 - 3.34</td>
</tr>
<tr>
<td>Radio</td>
<td>15.6</td>
<td>13.8</td>
<td>0.067</td>
<td>.795</td>
<td>1.16</td>
<td>0.37 - 3.58</td>
</tr>
<tr>
<td>Flyer/Letter</td>
<td>26.3</td>
<td>27.6</td>
<td>0.023</td>
<td>.880</td>
<td>0.93</td>
<td>0.39 - 2.25</td>
</tr>
<tr>
<td>Health Professional</td>
<td>31.3</td>
<td>27.6</td>
<td>0.211</td>
<td>.646</td>
<td>1.23</td>
<td>0.51 - 2.93</td>
</tr>
<tr>
<td>School Take-Home Info.</td>
<td>26.8</td>
<td>24.1</td>
<td>0.092</td>
<td>.762</td>
<td>1.15</td>
<td>0.46 - 2.87</td>
</tr>
<tr>
<td>Phone call</td>
<td>4.5</td>
<td>3.4</td>
<td>0.067</td>
<td>.796</td>
<td>1.31</td>
<td>0.16 - 10.81</td>
</tr>
<tr>
<td>Day Care</td>
<td>2.8</td>
<td>6.9</td>
<td>1.051</td>
<td>.305</td>
<td>0.39</td>
<td>0.08 - 1.99</td>
</tr>
<tr>
<td><strong>Language</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spanish</td>
<td>96.6</td>
<td>34.5</td>
<td>62.8*</td>
<td>&lt;.001</td>
<td>0.02</td>
<td>0.04-0.01</td>
</tr>
<tr>
<td>English</td>
<td>3.4</td>
<td>65.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Likelihood Ratio used because cells have expected counts less than 5.

There was no significant difference between the responses provided by both groups as related to questions, "I believe an elevated blood lead level may cause my child to do poorly in school (Mean Ranks: 105.390 vs. 88.480), I believe a child with elevated blood lead levels can be a very serious situation (Mean Ranks:105.240 vs. 96.380), I believe a child with elevated blood lead levels cannot be treated easily" (Mean Ranks: 102.160 vs.
Table 9 shows the Pearson $\chi^2$ test results on media and language preference for lead prevention messages. Respondents were able to choose one or more of the eight options offered. No significant difference was found for the media selected by foreign born Hispanics when compared to U.S. born respondents. Television was the medium most often preferred by both groups, although foreign born Hispanics had a higher frequency (55.3%) than U.S. born respondents (44.8%). Other media selected in order of cited preference by both groups included messages from health professional, take-home information provided through children's school and information through flyer/letter. The least preferred methods of communicating about lead prevention messages were radio, phone calls and day care. About 96.6% of foreign born Hispanics chose Spanish as their preferred language for prevention messages, showing there was a significant relationship between country of origin and language, $LR (1, N = 208) = 62.8, p < .001$.

**Logistic Regression Results**

Table 10 reports the logistic regression on variables identified as measures of acculturation. Criterion variables identified as measures of acculturation included: (1) Has the child traveled to Central or South America, (2) Has the child suffered from *empacho*, (3) Has *Azarcón* (home remedy) been used, (4) Has a *curandera/sobadora* been used, (5) Has traditional pottery been used, (6) Is there pica behavior (i.e., swallowed clay/soil, (7) Respondent's gender, (8) Respondent's education level, (9) Respondent's age, (10) Foreign born Hispanic or U.S. born respondent and (11) Respondent's primary language. Seven predictor variables or individual Models were
applied as predictors of the criterion variables. Predictor variables tested in each model included: (1) use of home remedy *Azarcón*, (2) has a *curandera/sobadora* been used, (3) has traditional pottery been used, (4) has a bean pot been used, (5) is there any pica behavior (swallowing of clay/soil), (6) does respondent eat imported candies, and (7) is there lead in the household. This last variable was determined by the number of items that tested positive for lead by household. Primary language (one of the criterion variables) was not useful in predicting any of the models.

Use of home remedy *Azarcón* (Model 1)

Stepwise logistic regression Model 1 explored the predictor variable, the use of the remedy *Azarcón* and the criterion variables which were identified as measures of acculturation. This model did not obtain any statistical significance, and we cannot reject the null hypothesis that at least one beta coefficient in the model is equal to zero. The low sample size of respondents reporting use of *Azarcón* may have affected the final results.

Curandera Use (Model 2)

Stepwise logistic regression Model 2 explored the relationship between the predictor variable, whether or not the respondent had a *curandera/sobadora* and the criterion variables which were identified as measures of acculturation. The final model had a positive goodness of fit test (Hosmer Lemeshow Chi Square = 1.188, $p = .997$). Furthermore, the final selected model had a significant Wald Test result (Chi Square = 49.660, $p < .001$). Three variables tested significant and were retained in the final model. The criterion variables of child suffering from *empacho*, respondent age and gender were useful in predicting respondent use of *curandera*. Cross validation against existing data was performed and the model correctly classified 83.0% of all cases.
<table>
<thead>
<tr>
<th>Criterion Variable</th>
<th>Predictor Variables</th>
<th>(Models)</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Use of Home</td>
<td>Been to</td>
<td>Traditional</td>
<td>Bean Pot</td>
<td>Swallowed</td>
<td>Eat</td>
<td>Lead in</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Remedy Azarcon</td>
<td>Curandera</td>
<td>Pottery</td>
<td>Usage</td>
<td>Clay Soil</td>
<td>Imported Candies</td>
<td>Household</td>
</tr>
<tr>
<td>Child Traveled Latin America</td>
<td>NS</td>
<td></td>
<td>NS</td>
<td>NS</td>
<td>0.939</td>
<td>.024</td>
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<tr>
<td>Child Empacho</td>
<td>NS</td>
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<td>4.198</td>
<td>&lt;.001</td>
<td>0.689</td>
<td></td>
<td>.048</td>
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<td>Home Remedy Use Azarón</td>
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<td></td>
<td>NS</td>
<td>NS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Been to Curandera</td>
<td>NS</td>
<td></td>
<td>NS</td>
<td>NS</td>
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<tr>
<td>Traditional Pottery</td>
<td>NS</td>
<td></td>
<td>NS</td>
<td>NS</td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Swallowed Clay Soil</td>
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<td></td>
<td>1.20</td>
<td>.002</td>
<td></td>
<td></td>
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<td>1.541</td>
<td>.016</td>
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<tr>
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<tr>
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<td>.035</td>
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<tr>
<td>Age</td>
<td>NS</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Foreign Born Hispanic or U.S. Born</td>
<td>NS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.186</td>
<td>.039</td>
</tr>
<tr>
<td>Primary Language</td>
<td>NS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>NS</td>
<td></td>
<td>4.623</td>
<td>-1.107</td>
<td></td>
<td></td>
<td>-4.142</td>
<td>0.376</td>
<td>-1.755</td>
</tr>
</tbody>
</table>
Use of Traditional Pottery (Model 3)

Stepwise logistic regression Model 3 explored the relationship between the predictor variable, whether or not the respondent had used traditional pottery and the criterion variables which were identified as measures of acculturation. The final model had a positive goodness of fit test (Hosmer Lemeshow Chi Square = 0.446, \( p = .800 \)). Furthermore, the final selected model had a significant Wald Test result (Chi Square = 15.860, \( p < .001 \)). Two variables tested significant and were retained in the final model. The criterion variables of child suffering from *empacho* and respondent's pica behavior were useful in predicting respondent use of traditional pottery. Cross validation against existing data was performed and the model correctly classified 67.1% of all cases.

Bean Pot Usage (Model 4)

Stepwise logistic regression Model 4 explored the relationship between the predictor variable, whether or not the respondent owned a bean pot and the criterion variables which were identified as measures of acculturation. The final model had a negative goodness of fit test (Hosmer Lemeshow Chi Square = 23.06, \( p = .0033 \)) so this model was rejected because it was not statistically significant. Furthermore, the final model selected had insignificant results with regards to the Likelihood Ratio and Wald Test result. Using these criterion variables, we were unable to predict accurately if a respondent would own a bean pot.

Pica Behavior (Swallowed Clay Soil) (Model 5)

Stepwise logistic regression Model 5 explored the relationship between the predictor variable, whether or not the respondent had eaten clay or soil and the criterion variables which were identified as measures of acculturation. The final model had a positive
goodness of fit test (Hosmer Lemeshow Chi Square = 0.935, \( p = .919 \)). Furthermore, the final selected model had a significant Wald Test result (Chi Square = 25.017, \( p < .001 \)). Three variables tested significant and were retained in the final model. The criterion variables of child traveling to Central or South America, the use of traditional pottery, and being foreign born Hispanic or U.S. born respondent were useful in predicting respondent pica behavior. Cross validation against existing data was performed and the model correctly classified 74.5\% of all cases.

**Consumption of Imported Candy (Model 6)**

Stepwise logistic regression Model 6 explored the relationship between the predictor variable, whether or not the respondent’s children had eaten imported candies and the criterion variables which were identified as measures of acculturation. The final model had a positive goodness of fit test (Hosmer Lemeshow Chi Square = 6.4582, \( p = .0249 \)). Furthermore, the final selected model had a significant Wald Test result (Chi Square = 8.923, \( p = 0.003 \)). Only one variable tested as statistically significant and was included in the model, whether or not the respondent had eaten clay or soil. Cross validation against existing data was performed and the model correctly classified 66.4\% of all cases.

**Presence of Lead Positive Objects in Respondents’ Home (Model 7)**

Stepwise logistic regression Model 7 explored the relationship between the predictor variable, whether or not the respondent had an object which tested positive for lead by federal standards and the criterion variables which were measures of acculturation. The final model had a positive goodness of fit test (Hosmer Lemeshow Chi Square = .002, \( p = .999 \)). Furthermore, the final selected model had a significant Wald Test result (Chi Square = 6.021, \( p = .014 \)). One variable tested significant and was retained in the final
model. The criterion variable of use of traditional pottery was useful in predicting if the respondent had leaded items in the home. Cross validation against existing data was performed and the model correctly classified 78.4% of all cases.

Table 11
Summary XRF Results of Items Tested During Survey Events

<table>
<thead>
<tr>
<th>Object</th>
<th>Freq.</th>
<th>Percent</th>
<th>Mean Lead</th>
<th>Min</th>
<th>Max</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metals ($\mu g/cm^2$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metal Charm/Pendant</td>
<td>30</td>
<td>40.5%</td>
<td></td>
<td>0.50</td>
<td>8,734.00</td>
<td>1,494.41</td>
</tr>
<tr>
<td>Metal Key</td>
<td>16</td>
<td>21.6%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metal Necklace Chain</td>
<td>11</td>
<td>14.9%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metal Chain</td>
<td>7</td>
<td>9.5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bracelet</td>
<td>4</td>
<td>5.4%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
<td>8.1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Metals</td>
<td>74</td>
<td>50.0%</td>
<td>490.31</td>
<td>0.50</td>
<td>8,734.00</td>
<td>1,494.41</td>
</tr>
<tr>
<td>Ceramics ($\mu g/cm^2$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cups/Mugs</td>
<td>23</td>
<td>46.9%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bowls</td>
<td>11</td>
<td>22.5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plate/Dish</td>
<td>9</td>
<td>18.4%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bean Pot</td>
<td>3</td>
<td>6.1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>6.1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Ceramics</td>
<td>49</td>
<td>33.1%</td>
<td>10,237.16</td>
<td>0.40</td>
<td>277,000.00</td>
<td>40,113.87</td>
</tr>
<tr>
<td>Plastics (ppm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toys</td>
<td>9</td>
<td>36.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lunchbag (Vinyl)</td>
<td>7</td>
<td>28.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purse/Backpack (Vinyl)</td>
<td>6</td>
<td>24.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cup</td>
<td>3</td>
<td>12.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Plastics</td>
<td>25</td>
<td>16.9%</td>
<td>1,015.48</td>
<td>124.00</td>
<td>6,924.00</td>
<td>1,466.91</td>
</tr>
<tr>
<td>Total Objects Positive for Lead</td>
<td>148</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Objects Tested</td>
<td>559</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Results from Items Tested During Survey Events

Table 11 lists a summary of XRF results of items tested during the study's survey and product testing events. Of the 148 items that tested positive for lead, 50% (74) were metals, 33.1% were ceramics and 16.9% (25) were made of plastics. The lead found in metals had a minimum level of 0.50 $\mu g/cm^2$ to maximum level of 8,734.0 $\mu g/cm^2$, with a
Mean of 490.3 µg/cm². Ceramic items had a minimum level of 0.40 µg/cm² and a maximum level of 277,000.0 µg/cm². The mean lead level for ceramic items was 10,237.2 µg/cm². Plastic items had a minimum lead level of 124.0 ppm with a maximum level of 6,924.0 ppm. The mean lead level for plastic items was 1,015.5 ppm. Charms and pendants were 40.5% (30) of the metal items testing positive for lead, while cups and mugs comprise 46.9% (23) of the ceramic items and toys were 36% of the plastic items brought by respondents which tested positive for lead.

Photos of a traditional ceramic mug and ceramic plate are shown below. These items were tested during the first survey event of this study and were found to exceed the allowable lead standard. Owners kept the items but were advised to discard if the glaze deteriorated, because it would allow leaching of lead into the drinks or foods ingested. Additional photos were taken of all items that had detectable levels of lead during the survey and product testing events.

Table 12 provides the results of a Pearson χ² test, comparing seven cultural practices to households where metal, ceramic and plastic items were found to contain lead through an XRF test (identified as lead positive items). Respondents who used traditional pottery were more often found (three times more) to have leaded items in their homes (32.47%
versus 12.61%) than respondents who did not have any leaded items in their homes. Thus, a significant relationship between lead positive items in households exists.

Table 12
Cultural Practices Compared by Households with Items that Tested Positive for Lead

<table>
<thead>
<tr>
<th>Cultural Practice / Belief</th>
<th>% Reporting</th>
<th>Item(s) Lead +</th>
<th>Item(s) Lead -</th>
<th>Pearson χ²</th>
<th>(p)</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home Remedy Use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes, Azarcon</td>
<td>12.50</td>
<td>87.50</td>
<td>0.290*</td>
<td>0.591</td>
<td>0.069 - 4.838</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No, Azarcon</td>
<td>19.80</td>
<td>80.20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of a curandera/sobadora</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>14.29</td>
<td>85.71</td>
<td>0.710</td>
<td>0.4</td>
<td>0.648 - 1.791</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>20.47</td>
<td>79.53</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of Traditional Pottery</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>32.47</td>
<td>67.53</td>
<td>11.355</td>
<td>0.001</td>
<td>3.3  - 6.858</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>12.61</td>
<td>87.39</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bean pot ownership</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>31.58</td>
<td>68.42</td>
<td>1.037*</td>
<td>0.308</td>
<td>0.617 - 4.908</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>20.96</td>
<td>79.04</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swallowed Clay/Soil</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>20.37</td>
<td>79.63</td>
<td>0.005</td>
<td>0.943</td>
<td>0.448 - 2.110</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>20.83</td>
<td>79.17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children eat imported candies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>19.71</td>
<td>80.29</td>
<td>0.085</td>
<td>0.771</td>
<td>0.443 - 1.829</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>21.43</td>
<td>78.57</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children wear jewelry</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>25.00</td>
<td>75.00</td>
<td>3.299</td>
<td>0.069</td>
<td>0.942 - 4.033</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>14.61</td>
<td>85.39</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children place jewelry in mouth</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>30.36</td>
<td>69.64</td>
<td>2.657</td>
<td>0.103</td>
<td>0.865 - 4.526</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>18.06</td>
<td>81.94</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Country of Origin</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic Foreign Born</td>
<td>17.88</td>
<td>82.12</td>
<td>0.642</td>
<td>0.423</td>
<td>0.269 - 1.738</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S.Born</td>
<td>24.14</td>
<td>75.86</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Likelihood Ratio used because cells have expected counts less than 1.
among the proportion of respondents who used traditional pottery, $\chi^2 (1, N = 196) = 11.355, p = .001$. A higher percentage of lead positive items (19.80%) were found in homes where there was no use of Azarcón home remedy in comparison with homes where Azarcón was used (12.50%). No relationship was observed between the following cultural practices and the identification of lead positive items: home remedy use, curandera/ sobadora use, bean pot ownership, pica behavior (swallowing clay/soil), children who eat imported candies, children who place jewelry in mouth and country of origin.

Table 12 also shows more lead positive items were found in homes where there was no use of curandera/sobadora (20.47%) and where children do not eat imported candies (21.43%) versus homes where there was use of curandera/ sobadora (14.29%) and where children eat imported candies (19.71%). U.S. born respondents had a higher percentage of lead positive items in their homes (24.14%) in comparison to foreign born Hispanics (17.88%). Households whose children wear jewelry were more apt to have a higher percentage of lead positive items (25.0%) than households where children do not wear jewelry (14.61%). Households whose children place the jewelry in their mouth also saw higher percentage of lead positive items (30.36%) than households whose children did not place jewelry in mouth (18.06%).

Test Results of Pottery/Ceramic Items Purchased From Commercial Facilities

This research study evaluated the presence of lead in pottery and ceramics purchased from seven commercial facilities located in Hispanic neighborhoods. Table 13 shows items purchased at Los Compadres, La Binta, El Rincon Latino, Marianas, and two locations of the Kings Ranch Market, and the Broad Acres Swap meet. In total, fifteen
<table>
<thead>
<tr>
<th>#</th>
<th>Purchase Location</th>
<th>Item Description</th>
<th>XRF Results (ppm)</th>
<th>GFAAS Leachate Results (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Trial 1</td>
<td>Trial 2</td>
</tr>
<tr>
<td>1</td>
<td>Los Compadres</td>
<td>Earthenware serving dish with clear glaze and green, brown, tan decoration</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Red earthenware bean pot, flaking glaze in brown, blue, green, white, and dark brown</td>
<td>540.6</td>
<td>545.7</td>
</tr>
<tr>
<td>2</td>
<td>Los Compadres</td>
<td>Orange Pot with white and blue decorative glazes</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Red clay mug with maroon glaze on lip and clear glaze on inside, no glaze on outer bottom</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>3</td>
<td>La Binta Market</td>
<td>&quot;Soup&quot; bowl, Made in China, Speckled</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>4</td>
<td>Kings Ranch</td>
<td>&quot;Soup&quot; bowl, Made in China, Speckled</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>5</td>
<td>Kings Ranch</td>
<td>Tortilla warmer, yellow with orange fruit and green leaves, Styrofoam on inside</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>6</td>
<td>El Rincon Latino Market and Gift</td>
<td>White bowl with grey circle</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>7</td>
<td>Mariana's</td>
<td>Blue Enamel, metallic cup</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>8</td>
<td>Mariana's</td>
<td>White metal pot with flowers, includes lid</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>9</td>
<td>Kings Ranch</td>
<td>Orange cup with blue glaze on mouth</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>10</td>
<td>Kings Ranch</td>
<td>White bowl with blue inside, Made in China</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>11</td>
<td>Kings Ranch</td>
<td>White bowl with green circle</td>
<td>ND</td>
<td>ND</td>
</tr>
</tbody>
</table>
Table 13
Summary XRF Results of Items Purchased at Ethnic Locations

<table>
<thead>
<tr>
<th>Pot #</th>
<th>Purchase Location</th>
<th>Item Description</th>
<th>XRF Results (ppm)</th>
<th>GFAAS Leachate Results (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>Los Compadres</td>
<td>Black-glazed bowl with neon yellow streaks</td>
<td>ND</td>
<td>ND, ND, ND, -0.146, -0.167</td>
</tr>
<tr>
<td>14</td>
<td>Los Compadres</td>
<td>Unglazed earthen bowl</td>
<td>901.3, 912.3, 917.8</td>
<td>-0.02, -0.084</td>
</tr>
<tr>
<td>15</td>
<td>Los Compadres</td>
<td>Unglazed earthen platter</td>
<td>559.9, 550.6, 552.5</td>
<td>1797.79, 1794</td>
</tr>
</tbody>
</table>

(Exceeds 100 ppm 2010 Standard
ND = non-detectable levels of lead)

(purchased items were analyzed for lead content (Gerstenberger, 2009). Three of the fifteen items had detectable levels of lead, as indicated by the XRF results. The mean lead concentrations of these items, from lowest to highest concentration, were 536.6 ppm, 554.3 ppm, and 910.5 ppm. In addition, each item was examined to identify the lead concentration of leachate, using the Food and Drug Administration (FDA) Graphite Flame Atomic Absorption Spectrometric (GFAAS) Determination of Lead Extracted from Ceramic Foodware methodology (FDA, 2011). Results from both the XRF and GFAAS analyses can be seen below. The presence of lead in consumer products constitutes a continued exposure risk, especially if items are intended for food. Only four of the fifteen items tested had warning labels, identifying the item be used only for decorative purposes. Item #15, which had the highest detectable level of lead in its leachate, did not have the warning label.

Test Results of Vending Machine Items Purchased From Commercial Facilities

In the following pages, Table 14 (Vending machine toys and containers exceeding CPSC standards) and Table 15 (Summary Store Locations and Sampled Vending
<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Toy and Container Description</th>
<th>Part of Toy/Container with Lead Hazard</th>
<th>Purchase Location</th>
<th>Toy XRF Analysis (ppm)</th>
<th>Container XRF Analysis (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VM.002</td>
<td>Yellow plastic ring, green container lid</td>
<td>Green Container Lid</td>
<td>Kmart, 89015 Unknown</td>
<td>None detected</td>
<td>972.51 ± 51.6</td>
</tr>
<tr>
<td>VM.034</td>
<td>Pink Power Ranger, green container lid</td>
<td>Green Container Lid</td>
<td>Viva Indoor Swapmeet, 89104 Unknown</td>
<td>None detected</td>
<td>1364.1 ± 65.7</td>
</tr>
<tr>
<td>VM.044</td>
<td>Hello Kitty charm, orange Coyote with bell, purple container lid</td>
<td>Metal fixture</td>
<td>Fry’s, 89115 Sanrio</td>
<td>8,300 ± 1,300 None detected</td>
<td></td>
</tr>
<tr>
<td>VM.051</td>
<td>Ariel Mirror charm, green Ariel Mirror charm, green container lid</td>
<td>Blue metal bell</td>
<td>Fry’s, 89115 Unknown</td>
<td>2,200 ± 200 None detected</td>
<td></td>
</tr>
<tr>
<td>VM.053</td>
<td>Metal charm bracelet, green Metal charm bracelet, green container lid</td>
<td>Metal fixture</td>
<td>Fry’s, 89115 Disney</td>
<td>5,900 ± 1,100 None detected</td>
<td></td>
</tr>
<tr>
<td>VM.062</td>
<td>Metal charm bracelet, green Happy face charm bracelet, white Metal Charm</td>
<td>Food 4 Less, 89121 Unknown</td>
<td>23,000 ± 1,800 None detected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VM.065</td>
<td>Metal charm bracelet, green Love charm bracelet, green container lid</td>
<td>Metal fixture</td>
<td>Food 4 Less Unknown</td>
<td>4,100 ± 900 None detected</td>
<td></td>
</tr>
<tr>
<td>VM.067</td>
<td>Metal Charm</td>
<td>Food 4 Less Unknown</td>
<td>21,600 ± 2,000 None detected</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Gerstenberger, 2010)

Machine Attributes) display information about items purchased from vending machines throughout the Las Vegas Metropolitan Area that were tested for lead.
Table 15
Summary Store Locations and Sampled Vending Machine Attributes

<table>
<thead>
<tr>
<th>Stores</th>
<th>Zip Code</th>
<th># of Toys Tested</th>
<th>Lead+ Toys</th>
<th>Toys exceeding CPSC standards**</th>
<th>Containers Lead+ Toys exceeding CPSC standards</th>
<th>Containers Toys made in China ***</th>
<th>Lead+ Toys Made in China</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Kmart</td>
<td>89015</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2 Smiths</td>
<td>89015</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3 Dollar Tree</td>
<td>89104</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>4 Viva Indoor</td>
<td>89104</td>
<td>19*</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td>Swap meet Mariana’s</td>
<td>89119</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6 Food 4 Less</td>
<td>89015</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>7 Los Compadres</td>
<td>89015</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>8 Fry’s Electronics</td>
<td>89115</td>
<td>18</td>
<td>4</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>9 Albertsons</td>
<td>89119</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10 Food 4 Less (Flamingo)</td>
<td>89121</td>
<td>7</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>

Total 68 8 6 2 2 39 8

*Three of the nineteen samples were stickers and excluded from testing.
**Lead concentration of toys > 300ppm for plastic toys or >0.06% for children’s metal jewelry
*** Toys with “China” or “Made in China” stamped or impressed directly on the item

(Gerstenberger, 2010)

Of the total 68 vending machine toys purchased from nine stores in ten different locations throughout the Las Vegas Metropolitan Area, eight toys and two lid container tested positive for lead. Only six toys exceeded CPSC lead standards for products intended for children under 12 years of age and children's metal jewelry. Products intended for children are allowed to contain 300 ppm of lead or less and components of children’s jewelry can contain up to 0.06% lead (600 ppm). The number of items
exceeding CPSC lead standards represented almost 12% (8/68) of the total items purchased. The lead detected on the metal portion of the six toys had a minimum level of 2,200 ppm to a maximum level of 23,000 ppm, with a Mean of 10,850 ppm. The two container lids found to contain lead had a minimum level of 972.5 ppm to a maximum level of 1,364.1 ppm, with a Mean of 1,168.3 ppm.

Table 15 shows stores, locations, zip codes, number of toys sampled and provides a list of vending machine item attributed per location. About 57.4% (39/68) of the sampled vending machine toys were manufactured in China. The eight toys that tested lead positive were made in China.

Photos of two of the eight vending machine items found to be above CSPC lead standards are shown in the following pages.

Figure 4 Hello Kitty Charm
Positive for Lead: Metal fixture attaching toy to lanyard (8300 ppm Pb ± 1,300)
Manufacturer: Sanrio
Figure 5 Ariel Mirror Charm
Positive for Lead: Metal fixture attaching charm to lanyard (5,900 ppm ± 1,100)
Manufacturer: Disney
Despite large amounts of national data on lead and childhood lead poisoning, the current status of childhood lead exposure in Nevada is unknown. In particular, exposure of children to lead as a result of cultural practices among the Hispanic population is poorly understood (Rothweiler et al., 2007; Gorospe & Gerstenberger, 2008; Cabb et al., 2008). Emerging Census data indicate Nevada’s rapid Hispanic population growth, characterized by immigrants from Latin and Central American countries and the large numbers of children who live at or below poverty (U.S. Census, 2007a, 2009a, 2009b) without health insurance, presents further concerns for the prevention of lead exposure. Hispanic immigrants often occupy older housing and suffer prior exposure to lead (Morales et al., 2005; Tehranifar et al., 2008). Although much of the lead in blood decreases over time when the exposure is removed, the lead that remains in the body is often stored in the bones (Geltman et al., 2001). Immigrants frequently continue to follow cultural and dietary practices, such as using imported consumables, home remedies and alternative medicine (i.e., healers/ sobadores), which can result in higher exposure to lead (Tehranifar, 2008). Statistically significant higher BLLs have been found in Hispanic children living in monolingual Spanish-speaking households than in children who live in English-speaking households (Morales et al., 2005). About 78% of the Hispanic households in Nevada are monolingual Spanish, making this group an important population to study regarding childhood lead poisoning (Pew Hispanic Center, 2007).
While a few studies have been conducted on the lead exposure of newly arrived immigrants (Tehranifar, 2008; Geltman et al., 2001; Rothenberg, Manalo, Jiang, et al., 1999; Rothenberg, Khan, Manalo, et al., 2000), the majority of research on the lead burden of people of Hispanic descent has been conducted in Mexico (Morales et al., 2005; Romieu et al., 1994; Lopez-Carillo et al., 1996; Villalobos et al., 2009; Meneses-Gonzalez, Richardson, Lino-Gonzalez & Vidal, 2003; Hernandez-Avila, Romieu, Rios, Rivero & Palazuelos, 1991; Hernandez-Avila, Gonzalez-Cossio, Palazuelos et al., 1996; Hernandez-Avila, Smith, Meneses, Sanin & Hu, 1998; Hernandez-Serrato et al., 2003; Schnaas et al., 2004; Mexico's Secretariat of Health, 2005). Much of that research identify cultural practices (i.e., use of clay ceramics and consumables) as the culprits for high levels of BLLs in the Mexican population. Since no comprehensive study has been conducted on this topic in Nevada (Rothweiler et al., 2007; Gorospe & Gerstenberger, 2008; Cabb et al., 2008), a focused research about Hispanics was needed to identify if and how the cultural and dietary practices and use of non-traditional sources may be impacting Clark County, the most populated county in Nevada.

The study's research objective of identifying cultural and dietary practices being followed by Hispanics and their impact on children's exposure to lead was addressed through the use of a culturally sensitive research design. A convenience sampling procedure that included a survey instrument and collateral recruitment materials translated to Spanish, a bilingual researcher who conducted a guided survey process in the same language and survey events held in familiar and nontargeting locations facilitated a culturally relevant process. Even with a culturally sensitive process, some respondents showed their discomfort with the study's 61-item survey by leaving questions
blank or by partially completing certain questions. The bilingual researcher reviewed for questions left blank, answered questions from respondents, and later provided a short lead prevention educational presentation to inform participants about lead exposure culprits and cultural practices that may place children at risk of lead exposure.

In order to have adequate statistical power to test the hypotheses, a power calculation for comparing two independent samples was performed to identify how many surveys needed to be completed. It was determined that an adequate sample size for each group (i.e., the foreign born Hispanics as compared to U.S. born respondents) would be 76 for a total study population (N) of 152. Although, 150 surveys were projected for the study to meet the power calculation, there were 212 surveys collected to represent at least 76 foreign born Hispanics. Only 29 U.S. born respondents (not 76) were enrolled in the study, meeting less than the target number projected during the power calculation. In spite of this limitation, results for certain measures analyzed using Pearson χ², Mann-Whitney U and stepwise logistic regression tests revealed similar associations across the three tests. A more robust comparison could have been possible had the estimates for each population been met.

Although the convenience sampling had been 300 surveys, the study's road to participant recruitment was slow. It took almost a year to recruit 212 respondents (i.e., July 2008 through May 2009), even with the support provided by three Hispanic churches and a nonprofit organization (East Valley Family Services [EVFS]). The churches helped recruit more than half of the respondents needed. The remainder of the respondents came from survey events at EVFS locations. At these sites, participants received extra encouragement to attend the events through phone calls provided by EVFS
staff a few days before the event. The phone calls reminded them to bring ceramic items, folk remedies, jewelry and candies to be tested. Still, attendance was lower than expected, with only a small percentage of respondents bringing items to be tested. Recruitment was halted when efforts to schedule more survey events with representatives from two additional nonprofit organizations and a large Hispanic church were unsuccessful, even when permission had previously been granted. A total of 212 surveys were collected, with 211 surveys being completed properly.

Conclusions and discussion, limitations and recommendations are presented in the following sections.

Conclusions and Discussion

Within the limitations of this study, analysis of the data and the findings presented in the Chapter 4, the following conclusions and discussion are being offered for the three questions driving this study.

(R$_1$) What are the sources of risk for lead exposure from cultural practices followed by the Hispanic communities?

Consistent with the literature and predicted outcomes, the number of respondents who used folk medicines (Azarcón) or a curandera/sobadora was greater in children who suffered from empacho. Families whose children had suffered from empacho were 11.6 times more likely to use a curandera/sobadora. The study also showed suffering from empacho was a proxy measure for stomach illness and significantly related to the use of folk remedies and folk healers. Children who had empacho were more than 2 times as likely to also suffer from stomach illness. There may be a connection between using the more traditional word empacho to describe stomach illness and seeking a more
traditional/cultural treatment for this folk illness. This connection seems to indicate respondents who were familiar with the term empacho may also be familiar with folk remedies (i.e., Azarcón) and the term curandera to treat this illness. Almost 50% of the foreign born and U.S. born respondents in this study reported having children who had suffered empacho. Hence, those reporting empacho would be predictive of using a folk remedy and curandera/sobadora.

(R2) Who are at risk for lead exposure from the cultural practices followed by the Hispanic communities?

Although almost 50% of respondents from each group reported their children suffered from empacho, the use of Azarcón was double (6.9%) for the U.S. born respondents as compared to foreign born Hispanics (3.4%). These results were contrary to the hypothesis that foreign born Hispanics, being less acculturated and more accustomed to using traditional folk remedies from their country of origin, would report greater use of these remedies. One reason for this unexpected outcome may be attributed to the way the survey question was worded. The survey asked respondents to select from several "named" folk remedies, including Azarcón, greta, rueda and others. During the survey events, this question caused the most confusion for respondents. Respondents often told the bilingual researcher they did not recognize any of the folk remedies listed in the survey. Many respondents left the question blank or wrote in the names of folk remedies they use like chamomile or mint teas. U.S. born respondents, whose frequency for using Azarcón was twice the rate of foreign born Hispanics, may have been more familiar with the names used on the survey (i.e., Azarcón) and likely purchased this remedy at local botánicas (herb stores) in Southern Nevada. A much better way to design this question
would have been to ask respondents about the use of a "white powder" (Azarcón) or an "orange power" (greta) to treat their child's empacho. By asking in a simple manner may encourage respondents with a low-level education to answer the questions about use of folk remedies. The SNHD staff responsible for receiving laboratory reports for all lead testing in Southern Nevada, follow a lead exposure protocol that may require a home lead investigation and further testing of the child or children. The epidemiologist from this team reported some success at communicating with families about the use of the white and orange powders to treat a stomachache or empacho (B. Argueta, Personal Communication, September 8, 2009). Not all lead exposure investigations and discussions with parents/guardians about possible sources of EBLLs have been successful. Some parents have been reluctant to report the use of the lead-laden powders that may have elevated a child's BLLs, so the EBLLs have not shown an expected decrease during an allotted time period. Such reluctance may also be common in many of the respondents in this study, which may translate to a higher use of folk remedies than the 8.5% frequency reported in this study.

While the U.S. born respondents had a higher use of folk remedy, foreign born Hispanics reported using curanderas/sobadoras at an 18.7% frequency as compared to 10.7% for the U.S. born respondents. One reason for this higher rate of curandera/sobadora use may be due to the percentage of Hispanics (42%) in Clark County who are poor as compared to 11% of Clark County's total population who live in poverty (American Community Survey, 2007). Access to health care for Hispanics living below the poverty level is limited, especially if they do not meet eligibility requirements for social programs (i.e., Medicaid or WIC). The Kaiser Foundation (2009) reported 35% of
Hispanics in Nevada during 2008 through 2009 did not have insurance. Nationwide, nearly 59% of illegal immigrants did not have health insurance in 2007, according to a report from the Pew Hispanic Center (2009). The number of illegal immigrants living in Nevada in 2005 were estimated to be between 150,000 and 200,000 by a Pew Hispanic Center (2006) report. While limited access to health care may prompt foreign born immigrants to a higher use of curanderas/sobadoras, the population's socio-cultural isolation in their "barrio," lack of funds to pay for Western medical services, limited access to transportation, or a desire to speak Spanish with the health care provider may also contribute to the use of folk healers (Sandler & Chan, 1978; Gordon, 1994; Reiner, 1983).

The 18.7% reported use of curandera/sobadora in Southern Nevada is more than 4 times higher than the 4.2% reported nationwide by Higginbotham, Treviño and Ray (1990) in their study of the 1982-1984 Hispanic Health and Nutrition Examination Survey. Respondents revealed during informal conversations with the bilingual researcher they used sobadoras instead of curanderas for folk illnesses, such as empacho. The survey question asking this information collected answers about the use of both types of healers, instead of allowing participants to separately select either one of the healers. Further research of this topic may be needed to identify if sobadoras are being sought more often than curanderas in Southern Nevada.

A higher proportion of foreign born Hispanics was expected to own a bean pot than U.S. born respondents. Instead, data collected in this study showed bean pot ownership for U.S. born respondents was at 15.4% as compared to 9.6% of foreign born Hispanics. Informal conversations with respondents during the survey events revealed many foreign
born Hispanics had bought aluminum cookware sets after arriving in the U.S. As the new immigrants became more "American" by buying cookware sets from new materials, their bean pots may have been passed down to their children or other family members. U.S. born respondents, on the other hand, may use clay bean pots as a way to retain family traditions. Further studies in this area may be needed to identify if these results are consistent with the actual use of bean pots for both populations. Many respondents reported how much better their beans taste when cooked in clay bean pots. Some respondents acknowledged receiving bean pots as gifts from family members or having purchased them back home.

As expected, pica behavior (i.e., eating soil, clay or ceramic pieces, also called geophagia), was more common among the foreign born Hispanic population than the U.S. born respondents. Study results show 30.8% of the foreign born Hispanics and 8% of the U.S. born respondents had experienced some pica behavior. There was a significant relationship between country of origin and the behavior. Foreign born Hispanics were 5.1 times as likely to have pica behavior than a U.S. born respondents. Much research has been conducted in Mexico, Los Angeles and in border areas with Mexico (Simpson, Mull, Longley & East, 2000; Rothenberg, Manalo, Jiang et al., 1999; Shannon, 2003; Rothenberg, Khan, Manalo & Norris, 2001) on pica behavior in immigrant women from Mexico, which sometimes were compared to U.S. born Hispanics during research (Bruhn & Pangborn, 1971; Shannon, 2003; Erdem et al., 2004; Hamilton, Rothenberg, Khan, Manalo & Norris, 2001; Lopez, Ortega Soler & Pita Martin de Portela, 2004). Pica behavior, especially geophagia, is recognized as a major source of lead for fetuses (transferred from the mother), children and adults. It has been
identified the cause for nutritional deficiencies in pregnant women. Results from cited research point to physiological and psychological reasons, and cultural, religious and medical beliefs (Hooda, Henry, Seyoum, Armstrong, & Fowler 2002; Hooda, Henry, Seyoum, Armstrong & Fowler, 2004) as reasons given for geophagia.

Respondents had difficulties answering the question that asked about pica behavior. The question was not clear about whom (i.e., the child, mother, or other family member) should be identified with the behavior. All pica behaviors were lumped into one question "sucked/ate/swallowed pieces of clay, mini bean pots or soil." A better way to collect data might have been to ask, "Have any of your family members sucked or eaten pieces of clay pottery or soil?" "If yes, please select which family members exhibited that behavior?" (child, mother, aunt, self, other) and then "Select the type of behavior displayed by each person selected (sucked or ate clay pottery pieces, ate soil)."

Expected outcomes for foreign born Hispanics being uninformed regarding the effects of lead on children were underscored by responses to seven Likert Scale questions. Data from these seven questions were analyzed using Pearson \( \chi^2 \) and Mann-Whitney U tests, each of which utilized different processes to generate results. Even with different processes, both tests revealed similar information about the populations being studied. Foreign born Hispanics believed "it would be expensive to get my child tested for lead." Costs for lead testing were considered to be a significant barrier (the \( \chi^2 \) results showed them to be 4.4 times as likely to agree with this statement). They also believed "treatment of EBLLs" would take too much spare time (they were almost 2.6 times as likely to agree with this statement). Mann-Whitney U results reported a lower Mean Rank for the foreign born Hispanics than the U.S. born respondents on the same two questions,
revealing they are less informed than their counterparts. Differences in how the two
groups answered these questions could be attributed to perceptions about what is
considered "expensive" and "time consuming" between the foreign born Hispanics and
the 21 U.S. Hispanics who participated in the study.

More than half of the foreign born Hispanics agreed with the statement, "I believe my
child has a high chance of getting elevated blood lead levels" than the U.S. born
respondents (26.3%). Mann-Whitney U results also showed foreign born Hispanics
agreed more with this statement than their counterparts, demonstrating they are more
informed about their high chance of their child getting elevated blood lead levels. Only
one of the three main Pearson $\chi^2$ results reported from this section and two of the three
Mann-Whitney U test results were statistically significant. It would have been appropriate
to have reduced the significant level for statistical testing from $\alpha = 0.05$ to $\alpha = 0.1$ for this
research study. These major results would have been statistically significant, showing a
more robust relationship between measures. It is common among the social science
research to reduce the acceptable level of Type I error to alpha=0.10, specially when
dealing with self reported surveys of behaviors or cultural practices (C. Cross, PhD.,
Associate Professor of Biostatistics, personal communication, April 7, 2011).

Additional similarities in Pearson $\chi^2$ and Mann-Whitney U test results were found
between the responses from each population. Foreign born Hispanics were at par or
slightly more informed than their counterparts for questions, "I believe an elevated blood
lead level may cause my child to do poorly in school" and "I believe a child with elevated
blood lead levels can be a very serious situation." Frequencies and Mean Ranks for these
questions demonstrated foreign born Hispanics and U.S. born respondents to be aware of
the perceived risks of lead exposure, the seriousness of this condition and its consequences. Responses to the question, "I believe I can prevent my child from getting lead poisoning," demonstrated the efficacy of both groups to take action in preventing this condition from occurring. Such efficacy provides a grand opportunity for engaging the community in child lead poisoning prevention.

(R3) What is the best approach to prevent the at-risk population from becoming exposed to lead through cultural practices?

Pearson χ² test results on media preference for lead prevention messages showed there was no significant difference in type of media selected by the foreign born Hispanics and U.S. born respondents. Television was rated higher by the foreign born Hispanics as compared to the U.S. born respondents as the medium most often preferred. Other media selected in order of cited preference were health professional, take-home information provided through children's school and information through flyer/letter. It is likely the high percentage of females (over 85%) who participated in this study chose television as their preferred medium, because they spend much of their time at home rearing children, hence more opportunity to watch television. Results for this section might have been different had a higher number of males participated in the study. For Hispanic males, who may usually find work in landscaping, construction and other manual labor, listening to the radio while on the job may be a better method to reach this group.

The least preferred methods of communication for respondents were radio, phone calls and day care. Experience with the Hispanic community has demonstrated collaboration with the radio stations increases the chances of success for health fairs and
other special events. The use of flyers alone without promotion through television or radio has proven to be less effective at reaching the target audience comprised of immigrants who may not be in the U.S. legally. Illegal immigrants in Nevada were estimated to be as high as 200,000 in 2005 by the Pew Hispanic Center (2006). That number may have decreased since 2007 when the economic downturn reduced the construction and landscaping jobs in Southern Nevada. These immigrants have the greatest need for information and services but are most difficult to reach. Hispanics prefer to attend events being coordinated by individuals whose organizations they know and trust, and with people with whom they have developed a relationship (i.e., a community center, nonprofit organization or local radio or television promoted event). Collaborations with nonprofit organizations, television and radio stations in coordinating special health fairs or educational workshops will be the most effective manner in which the information campaign may connect with the Hispanic population.

As predicted, Spanish was the preferred language to be used in lead prevention messages according to foreign born Hispanics and a small percentage of the U.S. born Hispanic respondents. Language is an indicator of the degree individuals have acculturated to American society. At the same time, language may also influence how these individuals respond to health promotion and behavior change campaigns and the type of media they choose. Acculturation may be explained as the process where one group contributes more to the flow of cultural elements than the other, much weaker one (Berry, 1980; Padilla, 1980a, 1980b; Elder, Ayala, Parra-Medina and Talavera, 2009). The weaker group acquires the cultural elements (i.e., language, food choice, dress, attitudes, norms and values) of the dominant society. In the acculturation process,
individuals may relinquish their cultural identity as they move into the larger society (assimilation), may integrate (maintain cultural integrity) as they move to become part of the larger society framework or may withdraw (reject) from the larger society altogether (Berry, 1980; Berry, 1987; Padilla & Perez, 2003). In their study about the Mexican population, Padilla (1980) and Keefe and Padilla (1987) demonstrated Mexicans have strong attachments and knowledge about their culture (cultural awareness) and prefer their ethnic groups with whom to recreate (ethnic loyalty). Their research showed cultural awareness declined from first (immigrant) generation to fourth generation of Mexican origin respondents, while ethnic loyalty to the culture of origin remained consistently high from the first to fourth generation. Even when they did not have first-hand knowledge of their culture and may no longer be able to speak Spanish, fourth generation respondents still held on to the Mexican heritage identity.

Almost 93% of this study's respondents were foreign born Hispanics who are most comfortable speaking Spanish. That large percentage of monolingual Spanish speakers is similar to the 78% of Hispanic households the Pew Hispanic Center (2007, 2009c, 2009e) identified in Nevada who speak monolingual Spanish. This Spanish-speaking group is likely target population for the lead prevention communication campaign being planned at the completion of this study. Statistically significant higher BLLs have been found in Hispanic children living in monolingual Spanish-speaking households than in children who live in English-speaking households (Morales et al., 2005).

As previous studies about acculturation have demonstrated, lead prevention messages will need to tap into the Hispanic's cultural awareness by using Spanish and relating to behavior and values of the Hispanic home, while supporting ethnic pride. The
opportunities of collaboration with nonprofit agencies, community centers, and stakeholders know and trusted to the Hispanic community will help ensure a better response to the health messages promoting behavior change.

During the lead prevention communication campaign, it will be important to explain the study's lead testing results of items (i.e., toys, ceramics, plastic and meal products) that pose a risk of lead exposure for Hispanic children. The next section presents a discussion of those results.

**(General Objective)** Of the metal, ceramics and plastics products that tested positive during special data collection events or of the products purchased in stores and vending machines throughout Southern Nevada, a higher number of metal products than ceramics or plastic products will exceed standards for lead exposure level.

Results from the XRF tests conducted on items collected during the scheduled product testing events and purchased at local stores and vending machines demonstrate lead is present in many products our children use. The survey and product testing events did not attract a wide variety of consumables most often identified by the literature. Of the 559 products tested, 148 tested positive for lead and included metal and plastic keys, toys, dolls, jewelry, children's clothing items, vinyl lunch boxes, bean pots and even purses. Of the lead positive items, 50% were metals, 33.1% were ceramics and 16.9% were made of plastics. Much of the gold jewelry and metal keys contained high percentage of lead. It was thought the children wearing jewelry would chew or place this jewelry in their mouths (the survey asked respondents about wearing jewelry and placing jewelry in mouths). During the survey and product testing events, no children were observed placing their own jewelry in their mouths. They were observed placing
their mother's chains, charms, and crosses in their mouths as their mothers carried the children in arms. When these charms and crosses were checked by XRF, these gold items had teeth marks and dents from the pica behavior. Some children were allowed to play with metal keys (the ones parents used for opening the cars or homes). Many keys tested were found positive for lead, hence a danger to children whose parents allow them to place in mouths. At each survey event, respondents received a 20-minute presentation that identified the lead exposures (i.e., folk remedies, candies, folk healers, ceramic items) and the risk lead poses to children's bodies. Parents were exhorted to prevent children from placing foreign objects or substances (pica behavior) in their mouths. Informational materials on lead poison prevention were distributed and lead screening opportunities at the SNHD discussed. Participants were encouraged maintain healthy children by following these recommendations.

Additional ceramic items and vending machine toys were purchased with the study's grant funds in stores throughout the Las Vegas Metropolitan Valley. This purchase ensured a wider variety of items identified by the literature review would be tested and documented in the research. About 3 of 15 purchased ceramic items (20%) and 8 (12%) vending items exceeded standards for lead exposure. All eight lead positive items were manufactured in China. Over half of the 68 sampled vending machine toys was manufactured in China, the country most often identified with items containing high percentage of lead. Because children are the main recipients of vending machine toys and are most vulnerable to the lead exposure, it is important to communicate to families how to protect their children by avoiding these types of purchases.
It should be mentioned these purchases represented a convenience sample of vending machine toys. These samples were collected as a pilot study, investigating the number of leaded objects that might be found in a sample of vending machine items from stores throughout Las Vegas. The sample was not distributed evenly nor randomly across the valley and may not represent an accurate sample of all vending machines in the valley. Hence, more research may be needed to quantify the actual prevalence of leaded toys in vending machines in the Las Vegas Metropolitan Valley.

**Logistic Regression Test--Conclusion about Criterion and Predictor Variables**

Logistic regression was applied to investigate the connection between certain traditional behaviors and measures of acculturation. It was proposed that recent immigration, recent travel to Latin America, being foreign born, and speaking only Spanish might suggest the respondent was less acculturated than respondents who were U.S. born and spoke English. For most of the logistic regression results, the proposed measures of acculturation did not definitively predict participation in certain traditional behaviors. Rather, specific elements of each behavior were found to be predictive of said behavior. However, in the model which describes use of traditional pottery, three measures of acculturation including being foreign born Hispanic, recent travel to Latin America, and speaking Spanish only predicted the self-reported use of traditional pottery in the home. There is probably a relationship between speaking Spanish, having close ties with the country of origin, and the use of traditional pottery.

The results of the stepwise logistic regression also indicated some useful associations between certain cultural practices and certain respondent characteristics. The cultural practice of using a *curandera/sobadora* was associated with self-reported *empacho* but
not stomach illness. Interestingly there may be a connection between using the more traditional word *empacho* to describe stomach illness and seeking a more *traditional/cultural* treatment for this folk illness. Also likely is that respondents who were familiar with the term *empacho* may also be familiar with the term *curandera*. In this study, almost 50% of the foreign born and U.S. born respondents reported having children who had suffered *empacho*. Hence, those reporting *empacho* would be predictive of using a *curandera/sobadora*. Also predictive of *curandera/sobadora* use, but to a much lesser degree, was respondent gender and age. Being older and female was predictive of *curandera/sobadora* use. This research only had 23 male respondents, too few to be able to predict why males were not connected to the use of *curandera/sobadora*.

Previous research has demonstrated a connection between using the more traditional word *empacho* to describe stomach illness and seeking a more *traditional/cultural* treatment for this folk illness. A 1966 study by Martinez & Martin reported 95% of 75 housewives interviewed had some knowledge of the folk diseases, including *empacho*. Another 95% reported one or more episodes of the illnesses in themselves, family or friends and 50% had sought treatment from a folk practitioner, a *señora*, or older woman who was either a *curandera* or *sobadora*. Risser & Mazur reported 36 (64%) of 51 Hispanic caregivers had some experience with *empacho* and 10 (20%) had sought treatment of folk illnesses for their children from a *curandera*. Lopez (2005) reported *empacho* and other seven folk illnesses were known to 70% of the sample of 70 women. Another 70% reported having "heard" of *curandero*, *sobador* and *yerbero* (herbalist).
Personal use of the practitioners by the respondents was limited to *curanderos* (25.7%) and *sobadores* (38.6%).

In this study's logistic regression results, being older and female was predictive of *curandera*/*sobadora* use. Research confirms the woman of the household is responsible for diagnosing illnesses, prescribing and administering folk medicine for minor ailments (i.e., headaches, mild colds, and stomachaches [Reinert, 1986; Gordon, 1994; Martaus, 1986; Eggenberger et al., 2006]). She will also decide when to seek someone (i.e., *curandera, sobadora* or older *señora*) from outside the family to treat the sick person.

Finally, the results of the logistic regression also demonstrated a relationship between the use of traditional clay pottery and the eating of clay soil. This relationship might be because in Latin American countries traditional clay pottery is utilized by the majority of the lower socioeconomic populations and *geophagia* (pica of clay soil and dirt) is found in pregnant women of all races and from lower socioeconomic levels. Even though the literature review did not link the use of traditional clay pottery with pica behavior, a connection between the lower socioeconomic level and close ties to folk beliefs may likely explain the relationship of these two measures.

Criterion variables and stepwise regression tests did not identify predictor variables (models) useful in predicting the use of home remedy *Azarcón* and bean pot usage. Primary language (one of the criterion variables) was not useful in predicting any of the models, because the majority of respondents were Spanish speaking. The cross-validation conducted for testing each model was performed with the existing dataset, which may weaken the results obtained for each of the models.
Pearson $\chi^2$ Test Conclusion on Relationship Between Lead Positive Items at Home and Cultural Practices Reported by Respondents

Pearson $\chi^2$ tests were also conducted to investigate the relationship between having lead positive (Lead positive) items at home (i.e., brought and tested during the survey events) and cultural practices self reported by respondents. These analyses served as a side project and were not part of the project's main goal. Items brought by respondents during the survey and product testing events were identified with the same unique number as the respondent. Since it was a voluntary effort, there was no control on the types of items that were tested for this event. The results may not accurately represent which respondents had lead positive items at home, since many of the participants did not bring items to test. U.S. respondents might have been more responsive to bringing items to be tested, which could account for U.S. born respondents having a higher percentage of lead positive in their homes in comparison to foreign born Hispanics.

A significant relationship between lead positive items in households exists among those respondents who used traditional pottery. More lead positive items were found in homes where there was no use of curandera/ sobadora and where children do not eat imported candies. Households whose children place jewelry in their mouth saw a higher percentage of lead positive items than households whose children did not place jewelry in mouth. The association between finding lead positive objects in the home and survey responses is weak at best. The study was not designed to predict those responses which were associated with finding lead positive items in the home. Rather, respondents were asked to bring items to be tested for lead as a convenience sample and reflect the respondents' belief about what they may consider to contain lead as compared items that
true contain lead. Respondents biased the results by selecting those items they believed may have lead. Perhaps they chose metal items, because they might have believed were lead positive, instead of bringing a folk remedy (*Azarcón* [CDC, 1981, 1983, 1993b]) or Mexican candy (Calif. Dept. of Health Services, 1993, 1994a, 1994b, 1998, 2001, 2004; CDC, 2002a), which have been documented by literature as more often containing lead. More research is needed to connect respondents' self-reported cultural practices and beliefs and leaded objects in the home. Studies which endeavor to connect cultural practices to the presence of actual lead positive items in the home need to test those items in the respondent's home rather than allow them to self select items to bring to a testing location. In this way, a clear connection can be made between responses and leaded items. Unfortunately, this study was not designed to make conclusions about practices and lead positive items in the home. However, it does evaluate known at-risk practices for lead exposure and compares them among different subsets of the Hispanic community.

Limitations

This research study had a number of limitations, suggesting the results are not representative of the entire population of Southern Nevada Hispanics. The study used a convenience, non-random sample that recruited respondents from three churches and from participants of parenting classes presented by staff from a non-profit organization. The sample size of 211 respondents is small when compared to the estimated number of Hispanics residing in Southern Nevada, 508,411 (Census, 2009f). Only those who agreed to participate in the study completed the questionnaire. This design had the potential for response bias. No information was collected from families which did not show up on the
survey and product testing event. It is possible the respondents who did not participate were different than those who responded to the survey. The survey data was self-reported, with recall bias and failure to disclose.

Survey respondents, in general, may have had difficulties understanding how to answer the 61-item survey. Except for 8 respondents who answered the "folk remedies" section, many left this section blank. Some could have difficulties understanding the names assigned the folk remedies or may have been confused about large table format used, where multiple questions were asked about the subject. Others may have been uncomfortable with self reporting the use of folk remedies for fear of repercussions or punishment (CDC, 1993b). The survey was too long and complex for the respondents whose level of education was low, with 69% of the foreign born Hispanics with elementary and some high school education but no high school degree. More than 27% U.S. born respondents self reported completing elementary school and some high school.

It is expected, many of the respondents have not had experience with opinion surveys, hence, were not comfortable with answering some of the questions. In an article from the Marketing Research Association's Alert Magazine, Lopez (2008) reported Hispanics approach survey questions as if they were an academic exam rather than an opinion poll. He claims newly arrived Hispanic immigrants are especially unsure about how to respond to survey research, opinion polls and number scales, such as those in Likert Scale style questions. Rather than give their opinion, Hispanic respondents are concerned about selecting the correct answer. Raw data from this study's Likert Scale style questions about knowledge regarding the effects of lead exposure, which were analyzed using Pearson $\chi^2$ test showed a large number of respondents had no opinion (option 3) for
many of the questions. One reason for choosing the non opinion answer may be the respondents' lack of efficacy in completing the survey or lack of information regarding the effects of lead. Respondents might have been too afraid to give an opinion about the subject matter. A much simpler style of survey is recommended to appropriately communicate at an education and acculturation level of respondents such as the ones in this study. The questionnaire was not a validated research tool and was not pretested to help identify difficulties with the questions (i.e., syntax or words being used), which may have prevented respondents from understanding or from answering truthfully. As such, all results from this study are limited in scope and representative only of the sample population being studied.

Recommendations

The results from this study demonstrate that while in the East, South and Central areas of the country lead-based paint may be a threat to children and their families, in this area, atypical lead hazards may be affecting Hispanic children more often without their parents' awareness (Baer et al, 1998; Lynch et al, 2000). The literature review has shown it is much more effective to focus on preventing lead exposure than address its negative effects to children’s health after the exposure has occurred.

Expected outcomes for low information from foreign born Hispanics about the effects of lead exposure on children were confirmed by responses to several questions in this study. At the same time, other results demonstrated foreign born Hispanics and U.S. born respondents are aware of the perceived risks of lead exposure, the seriousness of this condition and its consequences. Responses to the question, "I believe I can prevent my child from getting lead poisoning," demonstrated the efficacy of both groups to take
action in preventing this condition from occurring. Such efficacy provides a grand opportunity for engaging the community in child lead poisoning prevention.

Based on these results, it is recommended an informational campaign for Hispanic families be organized to address gaps in information regarding lead exposure effects on children as a result of nontraditional sources. Although lead prevention collateral materials developed by the SNHD can continue to be distributed at health fairs, the results of this study may be more effectively relayed through a short PowerPoint presentation developed in Spanish at sixth or seventh grade level of difficulty. The lead prevention message to be designed must also overcome barriers typically experienced in communications between cultures. Although Spanish is spoken by Mexicans, Cubans, Guatemalans, Puerto Ricans, etc., there are some minor differences in words and expressions used by each group. A certified translator will be utilized to translate documents in a universal Spanish without slang or colloquialisms from each Latin country or technical words. Samples of ceramic, toys and vending machine items found to exceed government lead standards commonly used by the Hispanic population will be showcased or highlighted at each of the informational presentations.

Source credibility will be important in breaking down communication resistance to primary prevention educational messages to the Hispanic community. Essential to the prevention information campaign will be reaching out to the church pastors and staff from East Valley Family Services, whose representatives supported this study and who are trusted by the communities they serve. These individuals (and the study's respondents) expressed an interest in learning the results of this research. Collaboration with the Spanish-speaking television, radio and print media will be significant in
diffusing the study's prevention recommendations. These organizations are trusted by the Hispanic community, with the television medium as the preferred method for receiving health information by foreign born Hispanics and U.S. born respondents in this study. Shorter lead prevention messages will be developed for interviews on radio and television programs and public service announcements.

The Health Belief Model (HBM) is being recommended for the lead prevention campaign messages. This Model is based on the understanding that a person will take a health-related action (i.e., not use folk remedies) if that person: (1) Feels a negative health condition (i.e., neurological damage will cause my child to do poorly in school) can be avoided, (2) Has a positive expectation that by taking a recommended action, he/she will avoid a negative health condition (i.e., avoiding lead containing products/items will be effective at preventing damage to my child's health), and (3) Believes that he/she can successfully take a recommended health action (i.e., I can prevent my child from getting exposed to lead with confidence). Lead prevention messages based on the HBM may inspire Hispanics to change behavior, thereby eliminating the use of cultural practices presented in previous sections.

Hispanics are guided by *familismo*, a cultural theme that expresses the importance of friends and extended family in helping to solve problems. The lead HBM prevention message must tap into *familismo* to engage the entire nuclear and extended family and friends to guard the health and welfare of the children. Lead prevention messages will ask each of these members to join in ensuring lead-based powdery folk remedies (*Azarcón* and *greta*) are not given to the children as treatment of *empacho*. At the same, the message will highlight the use of safe folk remedies like chamomile and mint teas and
oils for massaging the stomach or back for the discomfort of empacho. In this manner, the lead prevention message will avoid creating a conflict between folk beliefs and scientific medical practice that will lead to fear and rejection of proposed health education messages.

Lead screening costs and the extra time needed for treatment of EBLLs were identified by the foreign born Hispanics as significant barriers for parent engagement. Respondents were less informed about the effects of lead exposure on a child's performance in school, about the seriousness of the situation, and about the actual treatment of EBLLs. The barriers and lack of information about lead exposure effects can be addressed through the lead prevention messages. The Hispanic population will benefit from knowing lead exposure action levels, the SNHD lead exposure protocols, and what happens to a child once he/she has EBLLs. Generally, EBLLs under 40 µg/dL are expected to decrease with time after the "culprit" causing the lead exposure is removed from the child's environment (i.e., Mexican candies, folk remedies, dust, lead on window sills or blinds, etc.). SNHD (2005) protocol requires children with BLLs higher than 40 µg/dL to be referred to a clinician specializing in lead toxicity therapy using chelating agents. Each case is different and chelating agents may be recommended by the specialist in cases where the BLLs may be lower.

Hispanic businesses selling goods that may contain lead will be contacted and informed about the campaign. The goal will be to convince owners and key personnel to offer non-leaded products instead of items that may affect the health of children and families. The objective is to ensure the ceramic ware sold for decoration purposes is labeled appropriately, so there is no confusion on the part of the families who are buying
these products. Options for purchasing similar non-leaded products will be provided, in order to give customers the ability to keep using their clay bean pots, which they claim make a more flavorful bean soup. Distributors for non-leaded items will be contacted for ideas on how to establish a new line of products through programs like Barro Sin Plomo and Aid to Artisans, cooperatives promoting artisans who design lead-free products.

Research Recommendations

The following recommendations for further research about the Hispanic population are being made, using a simpler and shorter questionnaire that will be easier to understand for the younger Hispanic immigrant with a lower education lower level education:

• A study to assess the use of curandera or sobadora in Las Vegas Metropolitan area as it relates to acculturation (using one of the assessment tools identified in the literature review, Spanish language, identifying length of time in the U.S.), the types of illnesses treated by each (curandera or sobadora), the types of folk remedies recommended by the folk healer, using a more descriptive language (powdery substance) rather than the formal names Azarcón or greta.

• A study to assess pica behavior as it relates to other cultural practices, such as use of clay ceramic ware or bean pot, reason for the behavior, acculturation and the influences of the nuclear and extended families (is one of the family members one of these folk healers?)

• More research is needed to connect respondents' self-reported cultural practices and beliefs and leaded objects in the home. A study which endeavors to connect cultural practices to the presence of actual lead positive items in the home requires the testing of
items in the respondent's home rather than by asking respondents to bring items to be tested at a particular location. In this way, the researcher can observe and identify the items at the respondent's environment rather than have the person self select items that may or may not be lead positive. A clear connection can be made between responses and leaded items found in the home and used by the respondent.
APPENDIX 1

LEAD SURVEYS

1) Do you have any children or take care of any children who are under 6 years old?
   a) Yes
   b) No

2) **If you answered “Yes” to question 1**, how many children are under 6 years old?
   a) 1
   b) 2
   c) 3
   d) 4 or more

3) Have any of your children ever been in Mexico, Central America or South America?
   a) Yes
   b) No

4) Do any of your children play in dirt and put dirt in their mouth?
   a) Yes
   b) No

5) Have any of your children suffered from stomach illness?
   a) Yes
   b) No

6) Have any of your children suffered from **empacho**?
   a) Yes
   b) No

7) Which of the home remedies below have you used?

<table>
<thead>
<tr>
<th>Folk Remedy</th>
<th>Who gives remedy?</th>
<th>Where obtained?</th>
<th>Used How Often?</th>
<th>Date Last Used</th>
<th>Can we pick up a sample?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Azarcón</td>
<td>[ ] mom</td>
<td>[ ] grandmother</td>
<td>[ ] 2x daily</td>
<td>[ ] Yes</td>
<td>[ ] No</td>
</tr>
<tr>
<td>Greta</td>
<td>[ ] mom</td>
<td>[ ] grandmother</td>
<td>[ ] 2x daily</td>
<td>[ ] Yes</td>
<td>[ ] No</td>
</tr>
<tr>
<td>Alarcón</td>
<td>[ ] mom</td>
<td>[ ] grandmother</td>
<td>[ ] 2x daily</td>
<td>[ ] Yes</td>
<td>[ ] No</td>
</tr>
<tr>
<td>Rueda</td>
<td>[ ] mom</td>
<td>[ ] grandmother</td>
<td>[ ] 2x daily</td>
<td>[ ] Yes</td>
<td>[ ] No</td>
</tr>
<tr>
<td>Payloohah</td>
<td>[ ] mom</td>
<td>[ ] grandmother</td>
<td>[ ] 2x daily</td>
<td>[ ] Yes</td>
<td>[ ] No</td>
</tr>
<tr>
<td>Other: (Please explain)</td>
<td>[ ] mom</td>
<td>[ ] grandmother</td>
<td>[ ] 2x daily</td>
<td>[ ] Yes</td>
<td>[ ] No</td>
</tr>
<tr>
<td>Have not used these remedies.</td>
<td>[ ]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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8) Have you or your children been to a curandera/sobadora?
   a) Yes
   b) No

If you answered “Yes” to question 8, please answer questions 9 - 16.

9) What ailment was treated?
   a) Please explain: __________________________________________
   __________________________ __________________________________

   b) How long ago did you visit the curandera/sobadora? __________________

10) How was the ailment treated by the curandera/sobadora?
   a) I was given herbal tea.
   b) I was given a folk/home remedy.
   c) Other-please explain: __________________________________________

11) If the curandera/sobadora provided you a folk/home remedy, do you still have this remedy?
   a) Yes
   b) No

12) If you answered “Yes” to question 11, can our team pick up the remedy to test for lead?
   a) Yes
   b) No

13) How did you first learn about the curandera/sobadora?
   a) Family
   b) Friend
   c) Other: (Please Explain) __________________________________________

14) How often do you see the curandera/sobadora?
   a) Daily
   b) Weekly
   c) Monthly
   d) Other: (Please Explain) __________________________________________

15) What types of ailments/illnesses prompt you to visit a curandera/sobadora instead of a physician?
   a) Cold/flu
   b) Stomach ailment (empacho)
   c) Headaches
   d) Other: (Please Explain) __________________________________________

16) What types of ailment/illnesses prompt you to visit a physician instead of a curandera/sobadora?
   a) List: __________________________________________

LEAD INFORMATION

17) Has anyone ever suggested your children be tested for lead in their blood whether they were tested or not?
   a) Yes
   b) No
   c) Not sure

18) If you answered “Yes” to question number 17, please choose the person who made that suggestion.
   a) Doctor
   b) Nurse
   c) Social Worker
   d) Myself
   e) Other (Please Explain) __________________________________________

19) Have any of your children ever been found by a doctor or nurse to have elevated blood lead levels (defined as blood lead level of 10 microgram/per deciliter or greater)?
   a) Yes
   b) No

20) Have any of the children belonging to your friends or relatives ever had elevated blood lead levels?
   a) Yes
   b) No
21) Does your family use any pottery, handmade ceramic vessels or plates for cooking, eating or drinking?
   a) Yes
   b) No

22) If you answered “Yes” to question 21, have these pottery and ceramic vessels or plates been given to you by your family or friends?
   a) Yes
   b) No

23) If you answered “No” to question 22, where were these items purchased?
   a) U.S.
   b) Mexico
   c) Other—please explain: ____________________________ ______________________

24) Do you own a bean pot?
   a) Yes
   b) No

If you answered “Yes” to question 24, please answer questions 25-28.

25) How often do you use the bean pot?
   a) Daily
   b) Weekly
   c) Monthly
   d) Other—please explain: ____________________________ ______________________

26) How long do you let the beans sit in the pot?
   a) Overnight
   b) Two or three days
   c) Other—please explain: ____________________________ ______________________

27) Where was the bean pot purchased?
   a) U.S.
   b) Mexico
   c) Other—please explain: ____________________________ ______________________

28) Can our team test the bean pot for lead?
   a) Yes
   b) No

29) Have your children or any family members sucked/eaten/swallowed pieces of clay, mini bean pots or soil?
   a) Yes
   b) No

30) If you answered “Yes” to question 29, why were the pieces of clay, mini bean pots or soil eaten/sucked/swallowed? Select one or more of the answers listed below.
   a) Was pregnant
   b) Enjoyed the taste of clay/soil
   c) Needed minerals (iron, calcium, etc)
   d) Other—please explain: ____________________________ ______________________

31) Do your children eat imported candies?
   a) Yes
   b) No

32) If you answered “Yes” to question 31, what are the names of the candies your children eat? (or point to the candy poster being provided)
   a) ____________________________
   b) ____________________________
   c) ____________________________

33) Do you have any candies of these types available?
   a) Yes
   b) No

34) If you answered “Yes” to question 33, may our team have a sample to test for lead?
   a) Yes
   b) No
35) Do your children wear jewelry?
   a) Yes
   b) No
36) If you answered “Yes” to question 35, do your children place the jewelry in their mouths?
   a) Yes
   b) No
37) If you answered “Yes” to question 36, where was the jewelry obtained?
   ________________________________________________________________
38) Do you have this jewelry?
   a) Yes
   b) No
39) If you answered “Yes” to question 38, can our team test this jewelry for lead?
   a) Yes
   b) No
40) Please choose one or more ways from the list below by which children may get lead into their systems:
   a) Eating paint chips
   b) Putting their hands in their mouths when around soil or dust containing lead
   c) Eating imported candy containing lead in the wrapper or in the candy itself
   d) Using clay pottery with ceramic glaze
   e) Using folk/home remedies

PLEASE CIRCLE THE NUMBER THAT BEST describes your opinion of the following statements

41) I believe an elevated blood lead level may cause my child to do poorly in school.
   1   2   3   4   5
Strongly Agree Neither Disagree Strongly Agree
Agree Nor Disagree

42) I believe my child has a high chance of getting elevated blood lead levels.
   1   2   3   4   5
Strongly Agree Neither Disagree Strongly Agree
Agree Nor Disagree

43) I believe a child with elevated blood levels can be a very serious situation.
   1   2   3   4   5
Strongly Agree Neither Disagree Strongly Agree
Agree Nor Disagree

44) I believe a child with elevated blood levels cannot be treated easily.
   1   2   3   4   5
Strongly Agree Neither Disagree Strongly Agree
Agree Nor Disagree

45) I believe it would be expensive for me to get my child tested for lead.
   1   2   3   4   5
Strongly Agree Neither Disagree Strongly Agree
Agree Nor Disagree
46) I believe treatment for my child’s elevated blood levels would take too much spare time.

<table>
<thead>
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<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Neither</td>
<td>Disagree</td>
<td>Strongly Disagree</td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>Agree</td>
<td>Disagree</td>
<td>Disagree</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nor</td>
<td>Disagree</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

47) I can prevent my child from getting lead poisoning.

<table>
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<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Neither</td>
<td>Disagree</td>
<td>Strongly Disagree</td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>Agree</td>
<td>Disagree</td>
<td>Disagree</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nor</td>
<td>Disagree</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**DEMOGRAPHICS AND RACIAL/ETHNIC BACKGROUND**

48) What best describes your racial or ethnic background?
   a) White European
   b) African American
   c) Hispanic/Latino
   d) Asian
   e) Native American
   f) Other (Please specify) ____________________________

49) What is your country of origin?
   a) Mexico
   b) Cuba
   c) Puerto Rico
   d) United States
   e) Other (Please specify) ____________________________

50) What was your primary residence from birth to age 16?
   a) Mexico
   b) Cuba
   c) Puerto Rico
   d) United States
   e) Other (Please specify) ____________________________

51) What is your mother’s country of origin?
   a) Mexico
   b) Cuba
   c) Puerto Rico
   d) United States
   e) Other (Please specify) ____________________________

52) What is your father’s country of origin?
   a) Mexico
   b) Cuba
   c) Puerto Rico
   d) United States
   e) Other (Please specify) ____________________________

53) Which language do you feel most comfortable speaking?
   a) English
   b) Spanish
   c) Native dialect
   d) Combination of languages: Please explain: ____________________________

54) What is your gender?
   a) Male
   b) Female

55) What is your age?
   a) 0-20
   b) 21-24
c) 25-29
d) 30-34
e) 35 – 39
f) over 40

56) What is the highest level of schooling you completed? Choose one.
   a) Elementary school
   b) Some high school
   c) High School graduate
   d) Some college
   e) College graduate
   f) Graduate school

57) Do you have any question for us?
   a) ____________________________________________________________

58) What would be the best way to provide you with the information regarding the effects of lead and ways
to prevent lead poisoning?
   b) Television (Telemundo/Univision/Azteca America)
   c) Radio
   d) Personal communication through a flyer or letter
   e) Health professional (doctor/nurse/health educator/hospital)
   f) Take-home information provided to children at their school
   g) Phone call
   h) Day care center

59) In what language would you prefer that information?
   a) English
   b) Spanish

60) Would you like to receive the results of this lead survey?
   a) Yes
   b) No

61) If you answered “Yes” to question 60, provide the information requested below.
   Name: ________________________________________________________
   Address: _______________________________________________________
   Or Church where survey was taken: ________________________________

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ENCUESTA SOBRE EL PLOMO

1) ¿Tiene niños o cuida niños que sean menores de 6 años?
   a) Sí
   b) No

2) Si contestó “Sí” a la pregunta 1, ¿cuantos niños son menores de 6 años?
   a) 1
   b) 2
   c) 3
   d) 4 o más

3) ¿Alguna vez ha estado alguno de sus niños en México, Centro América o Sudamérica?
   a) Sí
   b) No

4) ¿Alguno de sus niños juega con tierra y se pone tierra en la boca?
   a) Sí
   b) No

5) ¿Alguno de sus niños ha sufrido problemas estomacales?
   a) Sí
   b) No

6) ¿Alguno de sus niños ha sufrido de empacho?
   a) Sí
   b) No

7) ¿Cuáles de los remedios caseros que se mencionan a continuación ha usado?

<table>
<thead>
<tr>
<th>Remedio Casero</th>
<th>¿Quién le da el remedio?</th>
<th>¿Donde lo obtiene?</th>
<th>¿Qué tan seguido lo usa?</th>
<th>Fecha en que lo usó la última vez</th>
<th>Nos puede proporcionar una muestra?</th>
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<tr>
<td>Azarcón</td>
<td>[ ] mamá</td>
<td>[ ] 2 veces/día</td>
<td>[ ] 1 vez a la semana</td>
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<td>[ ] Si</td>
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<td>Paylooa o Liga</td>
<td>[ ] mamá</td>
<td>[ ] 2 veces/día</td>
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<td>[ ] Si</td>
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<td>Otro: (Por favor explique)</td>
<td>[ ] mamá</td>
<td>[ ] 2 veces/día</td>
<td>[ ] 1 vez por semana</td>
<td>[ ] Si</td>
<td>[ ] No</td>
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<td></td>
<td>[ ] otro</td>
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<tr>
<td>No he usado estos remedios caseros.</td>
<td>[ ]</td>
<td>[ ] 2 veces/día</td>
<td>[ ] 1 vez por semana</td>
<td>[ ] Si</td>
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</table>
8) ¿Alguna vez ha llevado a alguno de sus niños con una curandera/sobadora?
   a) Sí
   b) No

Si contestó “Sí” en la pregunta 8, favor de responder las preguntas 9 -16.

9) ¿Qué problema fue tratado?
   a) Por favor explique: ____________________________________________

   b) ¿Hace cuanto tiempo visitó a la curandera/sobadora?__________________

10) ¿Cómo trató el problema la curandera/sobadora?
    a) Me dio te de hierbas.
    b) Me dio un remedio casero.
    c) Otro- por favor explique: ____________________________________________

11) Si la curandera/sobadora le dio un remedio casero, ¿todavía tiene el remedio?
    a) Sí
    b) No

12) Si contestó “Sí” en la pregunta 11 ¿puede alguien de nuestro equipo recoger el remedio para hacer pruebas para ver si tiene plomo?
    a) Sí
    b) No

13) ¿Cómo se enteró de esta curandera/sobadora?
    a) Familia
    b) Amigo
    c) Otro: (Por favor explique)___________________________________________

14) ¿Qué tan seguido ve usted a la curandera/sobadora?
    a) Diario
    b) 1 vez por semana
    c) Una vez al mes
    d) Otro: (Por favor explique)___________________________________________

15) ¿Qué tipo de dolencias/enfermedades la hacen ir a ver a la curandera/sobadora en lugar de un doctor?
    a) Resfrío/gripe
    b) Problemas del estomago (empacho)
    c) Dolores de cabeza
    d) Otro: (Por favor explique)

16) ¿Qué tipos de dolencias/enfermedades lo hacen ir a ver a un doctor en lugar de la curandera/sobadora?
    a) Anote: ____________________________________________________________

INFORMACIÓN SOBRE EL PLOMO

17) ¿Alguna vez alguien le sugirió que se le hicieran pruebas a sus niños para ver si tienen plomo en la sangre, aunque ya les hayan hecho pruebas antes?
    a) Sí
    b) No
    c) No estoy seguro

18) Si contestó “Sí” a la pregunta 17, por favor marque que persona le dio esa sugerencia.
    a) Doctor
    b) Enfermera
    c) Trabajadora Social
    d) Yo mismo
    e) Otro (Por favor explique)

19) ¿Alguna vez algún doctor o enfermera han descubierto que alguno de sus niños tiene plomo elevado en la sangre (definido como nivel de plomo en la sangre de 10 microgramos/por decilitro o más)?
    a) Sí
    b) No
20) ¿Alguno de los niños de sus amigos o familiares han tenido alguna vez niveles altos de plomo en la sangre?
   a) Sí
   b) No

21) ¿Su familia usa alfarería (ollas de barro), recipientes hechos a mano, platos para cocinar, comer o beber de cerámica?
   a) Sí
   b) No

22) Si contestó “Sí” a la pregunta 21, ¿Estos recipientes o platos de barro de cerámica se los regalaron familiares o amigos?
   a) Sí
   b) No

23) Si contestó “No” a la pregunta 22, ¿donde fueron comprados estos artículos?
   a) Estados Unidos
   b) México
   c) Otro- por favor explique: ______________________________ ______________________________

24) ¿Es usted dueño de una olla de barro para frijoles?
   a) Sí
   b) No

Si contestó “Sí” a la pregunta 24, responda a las preguntas 25-28.

25) ¿Qué tan seguido usa la olla de los frijoles?
   a) Diario
   b) Una vez por semana
   c) Una vez al mes
   d) Otro- por favor explique: ______________________________________________________

26) ¿Por cuanto tiempo deja los frijoles en la olla?
   a) Toda la noche
   b) Dos o tres días
   c) Otro- por favor explique: ______________________________________________________

27) ¿Donde compró la olla de frijoles?
   a) Estados Unidos
   b) México
   c) Otro- por favor explique: ______________________________________________________

28) ¿Puede alguien de nuestro equipo hacer pruebas de plomo en la olla?
   a) Sí
   b) No

29) ¿Sus niños o algún familiar han chupado, comido o tragado piezas de barro, ollitas de frijoles o tierra?
   a) Sí
   b) No

30) Si contestó “Sí” en la pregunta 29, ¿porque se chuparon o comieron las piezas de barro o la tierra?
   a) Ansiaba estos sabores porque estaba encinta
   b) Me gusta el sabor de barro o tierra
   c) Estaba falta de minerales (hierro, calcio, etc)
   d) Otra razón: ______________________________ ______________________________

31) ¿Sus niños comen dulces importados?
   a) Sí
   b) No

32) Si contestó “Sí” en la pregunta 31, cuales son los nombres de los dulces que comen sus niños? (o señale en el póster que le van a mostrar cuales son los dulces.)
   a) __________________________________________________
   b) __________________________________________________
   c) __________________________________________________

33) ¿Tiene alguno de estos dulces que nos pueda proporcionar?
   a) Sí
   b) No
34) Si contestó “Sí” en la pregunta 33, ¿le puede dar a alguien de nuestro equipo una muestra para que hagan una prueba de plomo?
   a) Sí
   b) No

35) ¿Sus niños usan joyería?
   a) Sí
   b) No

36) Si contestó “Sí” en la pregunta 35, ¿sus niños se ponen la joyería en su boca?
   a) Sí
   b) No

37) Si contestó “Sí” en la pregunta 36, ¿donde consiguieron la joyería?

38) ¿Tiene usted esta joyería?
   a) Sí
   b) No

39) Si contestó “Sí” en la pregunta 38, ¿puede alguien de nuestro equipo hacer pruebas de plomo en la joyería?
   a) Sí
   b) No

40) Por favor seleccione una o más de las maneras que se mencionan enseguida con las que los niños pueden ponerse plomo en su organismo.
   a) Comiendo pedazos de pintura
   b) Poniéndose las manos en la boca cuando andan cerca de tierra o polvo con plomo.
   c) Comiendo dulces importados que contienen plomo en la envoltura o en el mimo dulce
   d) Usando cerámica de barro con esmalte
   e) Usando remedios caseros tradicionales

POR FAVOR CIRCULE EL NÚMERO QUE MEJOR DESCRIBA SU OPINIÓN DE LAS FRASES SIGUIENTES

41) Creo que un nivel de plomo elevado en la sangre puede causar que mi niño tenga bajas calificaciones en la escuela.
   1    2   3  4  5
   Totalmente De acuerdo No estoy de acuerdo Ni estoy de acuerdo Totalmente en desacuerdo

42) Creo que mi niño tiene muchas posibilidades de obtener altos niveles de plomo en la sangre
   1    2   3  4  5
   Totalmente De acuerdo No estoy de acuerdo Ni estoy de acuerdo Totalmente en desacuerdo

43) Creo que si un niño tiene un nivel elevado de plomo en la sangre, puede ser un problema muy serio.
   1    2   3  4  5
   Totalmente De acuerdo No estoy de acuerdo Ni estoy de acuerdo Totalmente en desacuerdo

44) Creo que un niño que tiene un nivel elevado de plomo en la sangre, no se puede tratar fácilmente.
   1    2   3  4  5
   Totalmente De acuerdo No estoy de acuerdo Ni estoy de acuerdo Totalmente en desacuerdo

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45) Creo que me costaría caro que le hicieran pruebas de plomo a mi niño.

1 Totalmente De acuerdo 2 Ni estoy de acuerdo 3 No estoy de acuerdo 4 Ni en desacuerdo 5 Totalmente en desacuerdo

46) Creo que si le dan un tratamiento a mi niño para el nivel elevado de plomo en la sangre va a tomar mucho de mi tiempo.

1 Totalmente De acuerdo 2 Ni estoy de acuerdo 3 No estoy de acuerdo 4 Ni en desacuerdo 5 Totalmente en desacuerdo

47) Yo puedo prevenir que mi niño se contamine con plomo.

1 Totalmente De acuerdo 2 Ni estoy de acuerdo 3 No estoy de acuerdo 4 Ni en desacuerdo 5 Totalmente en desacuerdo

**ANTECEDENTES DEMOGRÁFICOS Y RACIALES/ÉTNICOS**

48) ¿Cómo describiría mejor sus antecedentes raciales o étnicos?
   a) Europeo Blanco
   b) Afro americano
   c) Hispano/Latino
   d) Asiático
   e) Nativo Americano
   f) Otro (Por favor especifique) ____________________________

49) ¿Cuál es su país de origen/nacimiento?
   a) México
   b) Cuba
   c) Puerto Rico
   d) Estados Unidos
   e) Otro (Por favor especifique) ____________________________

50) ¿En dónde vivió principalmente desde su nacimiento hasta los 16 años?
   a) México
   b) Cuba
   c) Puerto Rico
   d) Estados Unidos
   e) Otro (Por favor especifique) ____________________________

51) ¿Cuál es el país de origen/nacimiento de su madre?
   a) México
   b) Cuba
   c) Puerto Rico
   d) Estados Unidos
   e) Otro (Por favor especifique) ____________________________

52) ¿Cuál es el país de origen/nacimiento de su padre?
   a) México
   b) Cuba
   c) Puerto Rico
   d) Estados Unidos
   e) Otro (Por favor especifique) ____________________________
53) ¿En qué idioma se siente más cómodo hablando?
   a) Inglés
   b) Español
   c) Dialecto Nativo
   d) Una combinación de idiomas: Por favor explique: ______________________________
54) ¿Cuál es su género?
   a) Hombre
   b) Mujer
55) ¿Qué edad tiene?
   a) 0-20
   b) 21-24
   c) 25-29
   d) 30-34
   e) 35–39
   f) Más de 40
56) ¿Cuál es el grado de escuela más alto que tiene? Escoja uno.
   a) Primaria
   b) Algo de preparatoria
   c) Graduado de preparatoria
   d) Algo de colegio
   e) Graduado de colegio
   f) Escuela de post-grado
57) ¿Tiene usted alguna pregunta adicional que hacernos?

58) ¿Cuál sería la mejor manera de darle información respecto al plomo y maneras de prevenir el envenenamiento con plomo?
   a) Televisión (Telemundo/Univisión/Azteca América)
   b) Radio
   c) Comunicación personal por medio de volantes o cartas.
   d) Profesionales de la salud (doctor/enfermera/educador de salud/hospital).
   e) Llevar información que se proporcione a los niños en la escuela.
   f) Llamada telefónica.
   g) Guardería infantil
59) ¿En qué idioma preferiría la información?
   a) Inglés
   b) Español
60) ¿Le gustaría recibir los resultados de esta encuesta sobre el plomo?
   a) Sí
   b) No
61) Si contestó “Sí” a la pregunta 60, favor de proveer su nombre y dirección en la siguiente sección.
   Nombre: ___________________________________________
   Dirección ___________________________________________
   O iglesia donde se condujo la encuesta: ____________________________
TITLE OF STUDY: Identifying and reducing lead exposure associated with the use of traditional practices in southern Nevada Hispanic communities.

INVESTIGATOR(S): Dr. Shawn Gerstenberger, Dr. Maria Casas and Maria Castillo-Couch

CONTACT PHONE NUMBER: EOH main office: 702-895-5420

Purpose of the Study
You are invited to participate in a research study. The purpose of this study is to reduce the number of Hispanic children who are lead poisoned each year from the use of home remedies, cultural/traditional practices or imported products that contain elevated lead concentrations.

Participants
You are being asked to participate in a study because you are a Hispanic adult who may also have one or more children under the age of six years old. This survey hopes to identify the impact of cultural/traditional practices in the health of Hispanic children under six years of age.

Procedures
If you volunteer to participate in this study, you will be asked to do the following: Take a survey lasting approximately 15 minutes in which the surveyor will ask several questions that will help collect data about the subject matter. No personal information will be requested.

Benefits of Participation
There may be direct benefits to you as a participant in this study. After the surveys are collected and analyzed, you will receive informational materials on the results of this study, which may assist in incorporating new practices to prevent exposure to lead contaminated products. These materials will be provided in English and/or Spanish.

Risks of Participation
There are risks involved in all research studies. This study may include only minimal risks. These may include feeling slightly uncomfortable with some of the questions to which you will be asked to respond.

Cost /Compensation
There will not be financial cost to you to participate in this study. The study will take about 15 minutes of your time. You will not be compensated for your time.

Contact Information
If you have any questions or concerns about the study, you may contact Dr. Shawn Gerstenberger at 702-895-5420 or Maria Castillo-Couch at 229-6681. For questions regarding the rights of research subjects, any complaints or comments regarding the manner in which the study is being conducted you may contact the UNLV Office for the Protection of Research Subjects at 702-895-2794.
INFORMED CONSENT
Department of Environmental and Occupational Health

TITLE OF STUDY: Identifying and reducing lead exposure associated with the use of traditional practices in southern Nevada Hispanic communities.

INVESTIGATOR(S): Dr. Shawn Gerstenberger, Dr. Maria Casas and Maria Castillo-Couch

CONTACT PHONE NUMBER: EOH main office: 702-895-5420

Voluntary Participation
Your participation in this study is voluntary. You may refuse to participate in this study or in any part of this study. You may withdraw at any time without prejudice to your relations with the university. You are encouraged to ask questions about this study at the beginning or any time during the research study.

Confidentiality
All information gathered in this study will be kept completely confidential. No reference will be made in written or oral materials that could link you to this study. All records will be stored in a locked facility at UNLV for at least 3 years after completion of the study. After the storage time the information gathered will be shredded. In addition, any item(s) that we would acquire from you, or purchase as a result of conversations with you, will be kept confidential. Under no circumstances will individuals, stores or locations be identified.

Participant Consent:
I have read the above information and agree to participate in this study. I am at least 18 years of age. A copy of this form has been given to me.

_________________________________________   __________________________
Signature of Participant                                             Date

Participant Name (Please Print)

Participant Note: Please do not sign this document if the Approval Stamp is missing or is expired.
CONSENTIMIENTO
Departmento de Salud Ambiental y Ocupacional (EOH por sus siglas en inglés)

TITULO DEL ESTUDIO: Identificando y reduciendo exposición al plomo asociado con el uso de prácticas tradicionales en las comunidades hispanas del sur de Nevada.
INVESTIGADOR(ES): Dr. Shawn Gerstenberger, Dr. María Casas y María Castillo-Couch
NÚMERO DE TELÉFONO PARA COMUNICARSE: oficina principal del EOH: 702-895-5420

El Propósito del Estudio
Le invitamos a participar en un estudio de investigación. El propósito del estudio es reducir el número de niños hispanos que sufren de envenenamiento por plomo cada año por el uso de remedios caseros, prácticas culturales/tradicionales o por productos importados que contienen elevados contenidos de plomo.

Participantes
Le pedimos que participe en un estudio porque usted es un adulto hispano que puede tener uno o más niños menores de seis años de edad. Tenemos la esperanza de que con esta encuesta podamos identificar el impacto de las prácticas culturales/tradicionales en la salud de los niños hispanos menores de seis años de edad.

Procedimientos
Si usted participa como voluntario en este estudio, le vamos a pedir que haga lo siguiente: tomar una encuesta de aproximadamente 15 minutos de duración en la que el encuestador le hará varias preguntas que recabarán datos sobre el asunto en cuestión. No se le pedirá que proporcione información personal.

Beneficios por Participar
Puede haber beneficios directos por participar en este estudio. Después que las encuestas se colecten y analicen, usted recibirá material informativo sobre los resultados del estudio, los que pueden ayudarlo a incorporar prácticas nuevas para prevenir la exposición de productos contaminados con plomo. Estos materiales se proporcionarán en inglés y español.

Riesgos por Participar
Hay riesgos involucrados en todos los estudios de investigación. Este estudio puede incluir sólo riesgos mínimos. Estos pueden ser el sentirse ligeramente incomodo con algunas de las preguntas que se va a pedir que responda.

Costo/Compensación
No habrá costo financiero para usted por participar en este estudio. El estudio tomará aproximadamente 15 minutos. No se le pagará por participar.

Información para Comunicarse
Si tiene alguna pregunta o inquietud respecto al estudio, puede comunicarse con el Dr. Shawn Gerstenberger al 702-895-5420 o con María Castillo-Couch al 702-229-6681. Para preguntas respecto a los derechos de los sujetos de la investigación, cualquier queja o comentarios respecto a la manera en que el estudio esta siendo conducido, comuníquese a la Oficina de Protección de Los Sujetos de Investigación de la UNLV, al 702-895-2794.

Participación Voluntaria
Su participación en este estudio es voluntaria. Usted puede rehusarse a participar en este estudio o en cualquier parte de este estudio. Usted puede retirarse en cualquier momento sin prejuicio a sus relaciones con la universidad. Se le alienta a hacer preguntas sobre el estudio al empezar o en cualquier momento durante el estudio de investigación.
CONSENTIMIENTO

Departmento de Salud Ambiental y Ocupacional (EOH por sus siglas en inglés)

TITULNO DEL ESTUDIO: Identificando y reduciendo exposición al plomo asociado con el uso de prácticas tradicionales en las comunidades hispanas del sur de Nevada.

INVESTIGADOR(ES): Dr. Shawn Gerstenberger, Dr. Maria Casas y Maria Castillo-Couch

NÚMERO DE TELÉFONO PARA COMUNICARSE: oficina principal del EOH: 702-895-5420

Confidencialidad

Toda la información recabada en este estudio será conservada en absoluta confidencialidad. No se hará referencia en material oral o escrito que lo ligue a este estudio. Todos los registros serán guardados bajo llave en un inmueble de la UNLV por lo menos por 3 años después de que el estudio sea completado. Después del tiempo de almacenaje, la información recabada será destruida. Adicionalmente, cualquier artículo que se adquiera de usted, o que se compre a razón de nuestras conversaciones con usted, serán mantenedos en absoluta confidencialidad. No se identificarán personas ni negocios, ni se revelarán las direcciones de estos.

Consentimiento del Participante:

He leído la información arriba mencionada y estoy de acuerdo en participar en este estudio. Tengo cuando menos 18 años de edad. Se me ha proporcionado una copia de esta forma.

________________________________________________________________________
Firma del Participante                                             Fecha

Nombre del Participante (Por favor escriba con letra de molde)

Nota al Participante: Por favor no firme este documento si no aparece el Sello de Aprobación o si esta vencido.
This General Release of Liability (this “Release”) is made and entered into this ____ day of _________, 2009 by _____________________________ (“Owner”) in favor of the Board of Regents of the Nevada System of Higher Education, on behalf of the University of Nevada, Las Vegas, School of Public Health (“UNLV”).

Definitions

XRF means an x-ray fluorescence analyzer used to measure sample composition, especially for the detection of heavy metals. It performs its function by projecting and subsequently analyzing a reflected beam of x-rays.

ppm means parts per million.

Operator means each person performing tests on toys.

Preliminary Statements

WHEREAS, Owner has requested UNLV test various items (i.e., clay pots and vessels, home remedies, custom jewelry and toys);

WHEREAS, in exchange for this Release, UNLV will test various items (i.e., clay pots and vessels, home remedies, custom jewelry and toys) in collaboration with the Southern Nevada Health District for lead and other heavy metals, and provide information to Owner as to the heavy metal content of each item;

WHEREAS, collected items will be tested for lead (Pb) content via hand held XRF. You will be notified if any of your items exceed the current standards and regulations; however, we would strongly recommend that items exceeding established standards be disposed of properly. We will be happy to dispose of these items for you, or we may use them for educational purposes if they are donated.

WHEREAS, a UNLV representative will pick up items during events conducted at participating churches and other locations or from the Owner’s home. If the item does not contain lead or if the lead content is within stated federal standards, a UNLV representative will return it to the church or other location where the survey was conducted. The owner will be responsible for picking up the returned item at the designated location.

NOW THEREFORE, in consideration of the foregoing and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Owner agrees as follows:

Release

1. Owner is aware that testing for hazardous materials involves risks, dangers and hazards, both to the Operator, the surrounding environment and other persons within proximity, including release of a limited quantity of x-rays upon testing with an XRF and exposure to persons within proximity of the XRF. Owner agrees he/she will not be present or in proximity to the XRF during testing.
2. Owner agrees that UNLV is not responsible for the cost or replacement of any item damaged or displaced during testing.

3. Owner hereby does release, acquit and forever discharge the Board of Regents of the Nevada System of Higher Education, and its employees, officers, agents, representatives, insurers, successors and assigns, from any and all actions, suits, losses, claims, damages, expenses, judgments and executions, whether known or unknown, liquidated or unliquidated, fixed, contingent, direct or indirect (including pain and suffering, punitive damages, death, dismemberment, disability, physical or mental illness or the loss or destruction of the personal property of Owner) arising out of testing of toys, toy accessories and/or other articles or items and/or out of Owner’s action or inaction based upon the information contained in the testing results.

4. Owner agrees that UNLV will notify Owner if the lead content of any item tested equals or exceeds the current federal standard; however, UNLV has no further responsibility or obligation to Owner arising from such testing.

5. Owner acknowledges that the testing is voluntary and that this Release is made freely, voluntarily, and under no compulsion.

I have read, understand and agree to all terms and provisions of this Release.

----------------------------------------   -------- -------------------------
Authorized Signature    Date

<table>
<thead>
<tr>
<th>Owner Name</th>
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<tbody>
<tr>
<td>Address</td>
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<td>City State Zip</td>
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<td>Phone</td>
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<td>Fax</td>
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LIBERACION GENERAL DE RESPONSABILIDAD (FUERA DE INSTALACIONES)

La Liberación General de Responsabilidad (esta “Liberación”) se hace y lleva a cabo el día ____________ 2008, por ______________________ __________________________ (”Dueño”) en favor de la Mesa de Regentes del Sistema de Educación Superior de Nevada, en representación de la Escuela de Salud Pública de la Universidad de Nevada, Las Vegas (“UNLV”).

Definiciones

XRF significa analizador florecente de Rayos X, que se usa para medir composiciones de muestras, especialmente para la detección de metales pesados. Hace su función proyectando y subsecuentemente analizando un rayo de Rayos X reflejado.

ppm significa partes por millón.

Operador significa la persona que hace las pruebas en los juguetes.

Declaración Preliminar

CONSIDERANDO que, el Dueño ha pedido que la UNLV haga pruebas sobre varios objetos (por ejemplo; ollas y recipientes de barro, remedios caseros, joyería de fantasía y juguetes).

CONSIDERANDO que, a cambio de esta Liberación, la UNLV hará pruebas de plomo y otros metales pesados en varios objetos (por ejemplo: ollas y recipientes de barro, remedios caseros, joyería de fantasía y juguetes) en colaboración con el Distrito de Salud del Sur de Nevada y proveerá información al Dueño sobre el contenido de metales pesados que contiene cada objeto;

CONSIDERANDO que, se harán pruebas de contenido de plomo (Pb) en los objetos colectados con el XRF manualmente. Se le notificará a usted si alguno de sus objetos excede los estándares actuales y regulaciones; sin embargo, recomendaremos fuertemente que los objetos que excedan los estándares establecidos sean desechados de manera adecuada. Con mucho gusto nosotros podemos desechar estos objetos o podemos usarlos con propósitos educativos si son donados.

CONSIDERANDO que, un representante de la UNLV recogerá los objetos durante eventos conducidos en las iglesias que participan y en otros lugares o de la casa del Dueño. Si el objeto no contiene plomo o si el contenido de plomo está dentro de los estándares federales establecidos, un representante de la UNLV regresará el objeto a la iglesia u otros lugares donde la encuesta fue conducida. El Dueño será responsable de recoger el objeto regresado en el lugar designado.

LUEGO ENTONCES, tomando en cuenta lo anterior y otras buenas y valiosas consideraciones, de las cuales el recibo y suficiencia se reconocen aquí, el Dueño está de acuerdo en lo siguiente:

Liberación

1. El Dueño esta consciente de que las pruebas de materiales peligrosos conllevan riesgos y peligros, tanto para el Operador, el ambiente alrededor y otras personas que estén cerca, incluyendo la liberación de una cantidad limitada de Rayos X, al estar haciendo pruebas con el XRF y exponerse a personas que estén próximos al XRF. El Dueño esta de acuerdo en que el/ella no estará presente o cerca del XRF durante las pruebas.
LIBERACION GENERAL DE RESPONSABILIDAD (FUERA DE INSTALACIONES)

2. El Dueño acuerda que la UNLV no es responsable por los costos o reemplazo de cualquier objeto dañado o extraviado durante la prueba.

3. El Dueño, por medio de ésta libera, absuelve y suspende para siempre a la Mesa de Regentes del Sistema de Educación Superior de Nevada y sus empleados, oficiales, agentes, representantes, aseguradores, sucesores y asignatarios, de cualquiera y todas las acciones, demandas, perdidas, reclamos, daños, gastos, juicios y ejecuciones, ya sean conocidos o desconocidas, liquidadas o sin liquidar, fijos, contingentes, directos o indirectos (incluyendo dolor y sufrimiento, daños punitivos, muerte, desmembramiento, incapacidad, enfermedad física o mental, o la perdida o destrucción de propiedad personal del Dueño) que resulte de las pruebas de juguetes, accesorios de juguetes y/o otros objetos, artículos y/o de las acciones del Dueño o inacción que se base en la información contenida en el resultado de las pruebas.

4. El Dueño acuerda que la UNLV notificará al Dueño si el contenido de plomo de cualquier objeto probado sea igual o excede los estándares federales actuales; sin embargo, la UNLV no tiene mas responsabilidad u obligación hacia el Dueño que resulte de tales pruebas.

5. El Dueño reconoce que las pruebas son voluntarias y que esta Liberación se hace libre, voluntariamente bajo ninguna presión.

He leído, entiendo y estoy de acuerdo con todos los términos y provisiones de esta Liberación.

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<th>Fecha</th>
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<tbody>
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<table>
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APPENDIX 4

DESCRIPTION OF LEAD POSITIVE ITEMS TESTED DURING SURVEY EVENTS

Actual Lead Positive Items Tested During Survey Events

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Item Description</th>
<th>Plastics (Paint)</th>
<th>Metal (Paint)</th>
<th>Ceramics (Paint)</th>
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<tbody>
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<td><strong>exceeds std (µg/cm²)</strong></td>
<td><strong>exceeds std (µg/cm²)</strong></td>
<td><strong>exceeds std (µg/cm²)</strong></td>
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<th>Item Number</th>
<th>Item Description</th>
<th>Plastics (Paint)</th>
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<th>Ceramics (Paint)</th>
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<tbody>
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<td>8107-24001</td>
<td>Ceramic cup</td>
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<tr>
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<td>Ceramic dish</td>
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<td>8107-24007</td>
<td>Ceramic dish</td>
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<td>Plastic Camera</td>
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<td>Metal Chain</td>
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<td>Metal Cross Charm</td>
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<tr>
<td>8107-24098</td>
<td>Ceramic Bowl</td>
<td>1942 +/- 70</td>
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<tr>
<td>8107-24099</td>
<td>Vinyl Diaper Bag</td>
<td>**124 +/- 17</td>
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<tr>
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<td>Vinyl Lunch Bag</td>
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<tr>
<td>8107-24099</td>
<td>Vinyl Lunch Box</td>
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<tr>
<td>8107-24099</td>
<td>Metal Citrus Juicer</td>
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<td>675 +/- 50</td>
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<tr>
<td>8107-24099</td>
<td>Vinyl Lunch Box</td>
<td>*400 +/- 23</td>
<td></td>
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<tr>
<td>8107-24099</td>
<td>Metal Citrus Juicer</td>
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<td>8107-24102</td>
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<td>8107-24103</td>
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## Actual Lead Positive Items Tested During Survey Events

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<th>Item Number</th>
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<th>Ceramics XRF Readings</th>
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<td>Plastic Bear Eyes</td>
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# Actual Lead Positive Items Tested During Survey Events

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<thead>
<tr>
<th>Item Number</th>
<th>Item Description</th>
<th>Plastics (µg/cm²)</th>
<th>Metal (Paint) (µg/cm²)</th>
<th>Ceramics (Paint) (µg/cm²)</th>
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<td></td>
<td>1 (µg/cm²) = exceeds std</td>
<td>1 (µg/cm²) = exceeds std</td>
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<th>Item Number</th>
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<th>Plastics (µg/cm²)</th>
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<th>Ceramics (Paint) (µg/cm²)</th>
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<tbody>
<tr>
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<td>Metal Necklace</td>
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<td>8107-24163</td>
<td>Plastic Toy Car</td>
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<td>Plastic Reindeer Cup</td>
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<td>8107-24164</td>
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<td>8107-24169</td>
<td>Vinyl Lunch Bag</td>
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## Actual Lead Positive Items Tested During Survey Events

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<th>Item Number</th>
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<td>Ceramic bowl</td>
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# Actual Lead Positive Items Tested During Survey Events

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<th>Item Number</th>
<th>Item Description</th>
<th>Plastics <strong>(Paint)</strong> exceeds std</th>
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<td>1 (µg/cm²) = exceeds std</td>
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<td>ENG-0009</td>
<td>Vinyl Dr. Seuss Backpack</td>
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<td>ENG-0010</td>
<td>Metal Xylophone</td>
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<td>2578 +/- 130</td>
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</table>

**OCCURRENCES**  

|                        | 25 | 74 | 49 |

*Exceeds 300 ppm (August 14, 2009), **Exceeds 100 ppm 2010 Standard,  
***Inconclusive Result
APPENDIX 5

PERMISSION TO REPRINT TABLE FROM "THE STATUS OF CHILDHOOD LEAD POISONING AND PREVENTION IN NEVADA, USA"

March 4, 2011

Submitted by:
Anne Rothweiler Twomey
8353 Celina Hills Street
Las Vegas, NV 89131

Dear Ms. Rothweiler Twomey:

I am completing a doctoral dissertation at the University of Nevada Las Vegas entitled "Identifying and Reducing Lead Exposure associated with the Use of Cultural Practices in Southern Nevada Hispanic Communities." I would like your permission to reprint the Table 1 Federal Agencies and Regulations Regarding Lead in the Environment included in your 2007 article in the Scientific World Journal entitled "The Status of Childhood Lead Poisoning and Prevention in Nevada, USA." This table has been modified, updated and expanded in my dissertation. See attachment for the actual modified table.

The requested permission extends to any future revisions and editions of my dissertation, including non-exclusive world rights in all languages, and to the prospective publication of my dissertation by ProQuest through its UMI Dissertation Publishing business. ProQuest may produce and sell copies of my dissertation on demand and may make my dissertation available for free internet download at my request. These rights will in no way restrict republication of the material in any other form by you or by others authorized by you. Your signing of this letter will also confirm that you own [or your company owns] the copyright to the above-described material.

If these arrangements meet with your approval, please sign this letter where indicated below and return it to me in the enclosed return envelope. Thank you very much.

Sincerely,

Maria Castillo-Couch

PERMISSION GRANTED FOR THE USE REQUESTED ABOVE (see attachment):

[Signature]

Anne Rothweiler Twomey

3/9/11
Date
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VITA

Graduate College
University of Nevada, Las Vegas

Maria Castillo-Couch

Degrees:
Bachelor of Science, Business Administration, 1973
Master of Public Administration, 1997
University of Nevada, Las Vegas

Special Honors and Awards:
Employee of the Year (August 2004), City of Las Vegas
Employee of the Month (March 2004) City of Las Vegas
Finalist (2003) Las Vegas Chamber of Commerce Community Achievement Public
Service Award.
Award Recipient (2002) Thelma Clark Volunteer Award, Las Vegas Housing Authority.
Special Recognition (2001) U.S. Census Bureau
Award Recipient (2001) KLAS Channel TV 8 Hispanic Heritage Portraits of Success
Award.
Award Recipient (1999) Small Business Administration Minority Business Advocate
Award.
Dissertation Title: Identifying and Reducing Lead Exposure Associated with the Use of
Cultural Practices in Southern Nevada Hispanic Communities

Dissertation Examination Committee:
Chairperson, Shawn Gerstenberger, Ph.D.
Committee Member, Helen Neill, Ph.D.
Committee Member, Vern Hodges, Ph.D.
Graduate Faculty Representative, Michelle Chino, Ph.D.